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# CALIFORNIA STATE MINING BUREAU,

J. J. CRAWFORD, State Mineralogist.

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# THIRTEENTH REPORT

(THIRD BIENNIAL)

OF THE

# STATE MINERALOGIST

FOR THE

TWO YEARS ENDING SEPTEMBER 15, 1896.

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# In Memoriam.

## HON. JACOB ZIGLER DAVIS,

Died October 28, 1896,

IN PHILADELPHIA, PA.

At the regular meeting of the Board of Trustees of the California State Mining Bureau, held in the City of San Francisco, State of California, November 5, 1896, the following resolutions were unanimously adopted, ordered spread upon the minutes, and inserted in our forthcoming XIIIth Report:

WHEREAS, It has pleased an all-wise Providence to remove from our midst our esteemed friend and coadjutor, the Hon. Jacob Zigler Davis, for many years the faithful, zealous, and untiring President of the California State Mining Bureau; now, therefore, be it

*Resolved*, That by reason of his sudden demise we have lost an invaluable associate, and our State and city have been deprived of the unselfish and freely-given services of the best friend our institution has ever possessed. His purse was open to supplement our appropriation whenever needed. He has enriched our collection with many priceless specimens of metals, ores, and minerals, as well as with many very interesting curios, valuable relics, and works of art. His whole heart was wrapped up in the success of our Museum. We leave to other beneficiaries of his generosity the pleasing duty of reciting his many acts of charity and open-handed largess.'

We cordially indorse the expression of one who, in life, knew him most intimately, that "he was the best rich man in the City of San Francisco."

*Resolved further*, That as a last fitting act of respect to the memory of our late associate, the office of President of our Board remain vacant until his term would have expired, for in very truth we know of no man who can replace him.

(Signed:) W. S. KEYES,
T. B. BISHOP,
W. S. LYLE,
J. E. DOOLITTLE,
Trustees.

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*To his Excellency* JAMES H. BUDD, *Governor of California:*

SIR: The Trustees of the State Mining Bureau herewith submit their report, in pursuance of the Act of the Legislature approved March 23, 1893, entitled "An Act to provide for the establishment, maintenance, and support of a bureau, to be known as the State Mining Bureau, and for the appointment and duties of a Board of Trustees, to be known as the Board of Trustees of the State Mining Bureau, who shall have the direction, management, and control of said State Mining Bureau, and to provide for the appointment, duties, and compensation of a State Mineralogist, who shall perform the duties of his office, under the control, direction, and supervision of the Board of Trustees of the State Mining Bureau."

J. Z. DAVIS.
W. S. KEYES.
THOMAS B. BISHOP.
W. S. LYLE.
J. E. DOOLITTLE.

SAN FRANCISCO, September, 1896.

# REPORT

OF

# TRUSTEES OF STATE MINING BUREAU.

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The Trustees, in presenting herewith the Third Biennial or XIIIth eport of the State Mineralogist, take pleasure in commending the ıity of purpose and painstaking industry of the State Mineralogist and s assistants, both in the field and in the office. And they further ›mmend the good sense and self-sacrifice of the field men in willingly ıbmitting to a curtailing of their remuneration in the final months of ıe last fiscal year, in order that the Bureau might "live within its come" and avoid the necessity of appealing to the Legislature to ake up a deficiency. The Board also desires to mention the good work ›ne by Mr. F. W. Lees, License Collector of San Francisco, who for the ıarter ending September 30, 1896, collected the sum of $1,152 35 from ıe tax on stock certificates for the benefit of the Mining Bureau Fund, ıd to suggest that if the County Tax Collectors would do likewise the ureau would be in a position to accomplish more work.

## MUSEUM.

In pursuance of the plan, adopted two years ago, to restrict the :hibits in the Museum to such material only as may serve to display ıe mineral resources of the State, it has been deemed wise to turn over the Park Museum, in the City and County of San Francisco, certain skimo and Indian curios.

The space thus gained—four entire floor cases and one complete ›right set of shelves—has enabled the Curator of the Museum to dis- ıay quite a number of the specimens of ores, earths, and minerals ›llected by the field assistants and donated by individuals. The ›right set of shelves has been entirely filled with a full set of typical all and other rocks, illustrating the geology of the so-called great Mother Lode" of the State. This series of rocks was collected by field ssistant Harold W. Fairbanks. We venture the assertion that this :hibit is unique of its kind, is very nearly exhaustive, and is well orthy of close examination and study.

The continued popularity of the Museum is shown by the number of ımes registered, viz., 54,478, in the last two years. Included in this tal we find the names of 572 pupils of our public schools.

There have been added to the catalogue, and properly labeled, 657

exhibits, not including the 500 rock samples collected by Assistar Fairbanks.

Since the publication of the last report, there have been added to th Museum a large number of attractive and useful exhibits. Among thes we may mention a miniature duplicate of a ten-stamp gold mill, bui upon a scale of one inch to the foot. This model, including engin engine-house, shaft of the mine, and shaft-house, covers a space $12\frac{1}{2}'$x $2\frac{1}{2}$ The Bureau is indebted for this extremely practical exhibit to the Pres dent of the Board, Mr. J. Z. Davis, who has still further evinced h interest in the Museum by contributing some 125 choice minerals.

It would require a large amount of space to mention all the donatior received, and the Board of Trustees must, perforce, content itself wit hereby publicly thanking these friends of our institution. Withou intending to show any invidious distinctions, the Trustees venture t call attention to the following contributions, viz.: A remarkable spec men of stalactitic limonite, from Mr. Charles Camden, of Shasta County a large relief map of Sierra County, from the Sierra County Miner Association; crystallized cinnabar, from the Altoona Quicksilver Mir ing Co.; and a number of very characteristic and valuable specimer of calcareous alabaster (Mexican onyx) and variegated marbles, fro Mr. A. L. Seager.

The Trustees acknowledge, with thanks to the Placer County Miner Association, the gift of four showcases used at the Midwinter Fair hel in this city in 1893.

The Trustees are pleased to recognize the increase to our collectior through valuable interchanges of specimens with the U. S. Nation Museum at Washington, D. C.; with the School of Mines of Colorad with the Perak Museum of the Straits Settlements; with the Departmer of Mines of New South Wales, etc.

## LABORATORY.

Since the publication of the last report there have been received ar answered 884 letters of inquiry, and with them have come 1,571 packag of ores and rocks.

There have called for information in person, 563 individuals, wh have brought with them 798 packages of minerals. All have bee answered. In addition, the Laboratory has furnished 22 analyses coals and 8 qualitative analyses of water.

## LIBRARY.

There have been added to the Library by purchase, since the la report, only fourteen volumes, for the reason that the Trustees ha deemed it wise to expend the small available funds for other purpose Considerable additions have, however, been made from placing upon th shelves many of the publications of the General Government, as well the geological reports of other States, besides monographs, bulletins, et from numerous scientific bodies and associations, both domestic ar foreign. The sum total of the bound volumes in the Library no amounts to the respectable number of 4,400.

The Librarian has, during the last two years, distributed through th

ail and otherwise, more than 8,000 copies of the Reports of the State ineralogist, and over 25,000 maps and bulletins. He has, also, during e same period of time, written some 11,000 letters in reply to inquir- g citizens asking information as to matters touching the metallurgical, e mineral, and kindred resources of our State.

That the Library continues in popularity is shown by the fact that an rerage of over 1,000 visitors per month have availed themselves of the inted information borne upon its shelves.

## FACILITIES FOR RECEIVING SPECIMENS.

The Trustees desire again to express the thanks of themselves and the ıblic of our State to Wells, Fargo & Co., and the Oceanic Steamship ompany, for the free transportation of specimens and exhibits directed the Bureau.

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Logan, W. B., Jr.
Ludwig, J. D.
Lyons, Chas.
McCarthy, James
McCartney, W.
McDermott, A. L. F.
McDonald, D. A.
McMillan, A.
McMillan, F.
McSorley, T.
Mack, P. H.
Madeira, Geo.
Mason, W. Q.
Mast, Chas. L.
Mayflower Mining Co. of Nevada City.
Mendenhall, A.
Moore, Albert
Morongo King Mining Co.
Mott, Frank
Mt. Leyshon Mining Co., Ltd.
Nier, J. W.
Noble, Thos. & Sons
Oldham, Louis
Orear, H. W.
Parrett, J.
Pattee, Solon
Perry, Mrs. J. W. S.
Pierson, J. W.
Pratt, E. B.
Quin, T. C.
Quinby, W. C.
Rabe, Dr. John
Rathbun, J. P.
Rhodes, M. G.
Rice Bros.
Robinson, A. J.
Root, W. C.
Rostel, C. B.
Saladin, E.
Sanders, T. B.
Scott, Ira A.
Scott, J. A.
Scupham, J. R.
Seager, A. L.
Shenandoah Gold Mining Co.
Shepard, A. D.
Shooter, T.
Sierra County Miners' Ass'n
Sierra Gold Mining Co.
Skinner, Mr.
Smith, E. E.
Smith, Capt. Oliver
Standart, G.
Stanley, J. P.
Stewart, John
Stockwell, H. E.
Stone, D. C.
Storch, J. B.
Storey, G.
Storms, W. H.
Stow, W. W.
Taylor, S. S.
Theisen, John
Tomlinson, E. H.
Thomas, B. S.
Thomas, W. P.
Traphagen, F. W.
Trenschel, A. F.

Tourtellotte, Mrs.
Veatch, J. A.
Violetti, G.
Voorheis, E. C.
Waldron, C.
Walker, W.
White, J. S.
Whitney, W.
Willis, G. F.
Williams, Benjamin
Williams & Tong
Williamson, Mrs. M. B.
Winter, L. H.
Wolcott, John R.
Womble, Alex. M.
Yates, Dr. L. G.
Yeaw, W. E.
Young, Mrs. J.
Young, N. J.
Young, T. M.
Yerington, J. A.
Zachert, J.

## STATE BOARD OF TRADE—ATLANTA EXPOSITION.

A typical and extensive exhibit of the rocks, ores, earths, and mir erals of our State was, in April of the present year, supplied by th Curator of the Museum to the State Board of Trade, which may be see at their rooms, No. 16 Post Street, in this city.

A comprehensive exhibit of minerals and ores was, upon request the Georgia State Board of Trade, forwarded to Atlanta, Ga., to be di played at the Industrial Exposition held in that city in the latter pa of last year. After the close of the exhibition, the contribution was, b order of the Board of Trustees, presented to the Georgia Normal an Industrial Institute at Milledgeville, the capital, where it will be pe manently open to public inspection.

## LIST OF NEWSPAPERS RECEIVED IN EXCHANGE.

We are greatly obliged to the editors and publishers for the followin papers, which have been forwarded free to the Bureau during the la two years:

| Name of Paper. | Place of Publication. | State. |
|---|---|---|
| Amador Dispatch | Jackson, Amador County | California. |
| Anaheim Gazette | Anaheim | California. |
| Arroyo Grande Herald | Arroyo Grande | California. |
| Alameda Encinal | Alameda | California. |
| Adin Argus | Adin, Modoc County | California. |
| Amador Ledger | Jackson, Amador County | California. |
| Angels Voice | Angels, Calaveras County | California. |
| Amador Record | Sutter Creek | California. |
| Blue Lake Advocate | Blue Lake, Humboldt County | California. |
| Bullion | Los Angeles | California. |
| Burney Valley Bulletin | Burney Valley, Shasta County | California. |
| Berkeley Daily Advocate | Berkeley | California. |
| Californian | Bakersfield | California. |
| Calaveras Citizen | San Andreas | California. |
| Calaveras Chronicle | Mokelumne Hill | California. |
| Calaveras Prospect | San Andreas | California. |
| Chino Valley Champion | Chino | California. |
| Citrograph | Redlands | California. |
| Cloverdale Reveille | Cloverdale | California. |
| Contra Costa Democrat | Martinez | California. |
| Contra Costa Gazette | Martinez | California. |
| Corning Observer | Corning | California. |
| Colfax Sentinel | Colfax | California. |
| Colusa Sun | Colusa | California. |
| Commercial Bulletin | Los Angeles | California. |
| Colton Chronicle | Colton | California. |
| Central Californian | San Miguel | California. |
| California Voice | Los Angeles | California. |
| Daily Tidings | Grass Valley | California. |
| Del Norte Record | Crescent City | California. |
| Democratic Banner | Sonora | California. |
| Dixon Tribune | Dixon | California. |
| Dispatch-Democrat | Ukiah | California. |
| Dunsmuir News | Dunsmuir | California. |
| Escondido Times | Escondido | California. |
| Express | Los Angeles | California. |
| Eureka Sentinel | Eureka | California. |

| Name of Paper. | Place of Publication. | State. |
|---|---|---|
| Evening Herald | Nevada City | California. |
| El Dorado Republican | Placerville | California. |
| Eel River Valley Advocate | Fortuna, Humboldt County | California. |
| Fresno County Enterprise | Selma | California. |
| Fresno Expositor | Fresno | California. |
| Fresno Republican | Fresno | California. |
| Free Lance | Hollister | California. |
| Four Corners | Wheatland | California. |
| Free Press | Redding | California. |
| Gilroy Gazette | Gilroy | California. |
| Globe Review | | |
| Gridley Herald | Gridley | California. |
| Georgetown Gazette | Georgetown | California. |
| Humboldt Times | Eureka | California. |
| Humboldt Standard | Eureka | California. |
| Herald-Democrat | Leadville | Colorado. |
| Herald, The | Dunsmuir | California. |
| Independent Calistogan | Calistoga | California. |
| Inyo Register | Bishop | California. |
| Ione Valley Echo | Ione City, Amador County | California. |
| Inyo Independent | Independence | California. |
| Investor, The | Los Angeles | California. |
| Lassen Advocate | Susanville | California. |
| Loomiston Journal | Loomiston | Washington. |
| Livermore Herald | Livermore | California. |
| Los Baños Enterprise | Los Baños | California. |
| Los Gatos Chronicle | Los Gatos | California. |
| Madera Mercury | Madera | California. |
| Mining Industry | Denver | Colorado. |
| Mining News Era | Forbestown | California. |
| Mining and Metallurgical Journal | Los Angeles | California. |
| Morning Press | Santa Barbara | California. |
| Mining Standard | Sydney | New South Wales. |
| Middletown Independent | Middletown | California. |
| Mountain Messenger | Downieville | California. |
| Monterey Cypress | Monterey | California. |
| Mountain Democrat | Placerville | California. |
| Mariposa Gazette | Mariposa | California. |
| Mining Review | Spokane | Washington. |
| Mining Review | Ontario | Canada. |
| National City Record | San Diego | California. |
| Napa Register | Napa City | California. |
| New Era | Perris | California. |
| Nevada Evening News | Nevada City | California. |
| Nevada Transcript | Nevada City | California. |
| New North West | Deer Lodge | Montana. |
| Newcastle News | Newcastle | California. |
| Nevada Evening Herald | Nevada City | California. |
| Nevada State Journal | Reno | Nevada. |
| News, The | Pasadena | California. |
| Nugget, The | Placerville | California. |
| Oakdale Graphic | Oakdale | California. |
| Oakland Enquirer | Oakland | California. |
| Oakland Tribune | Oakland | California. |
| Ontario Record | San Bernardino | California. |
| Oroville Mercury | Oroville | California. |
| Oroville Register | Oroville | California. |
| Pacific Tree and Vine | San José | California. |
| Petaluma Courier | Petaluma | California. |
| Petaluma Weekly Argus | Petaluma | California. |
| Pleasanton Times | Pleasanton | California. |
| Placer Argus | Auburn | California. |
| Placer Herald | Auburn | California. |
| Placer County Republican | Auburn | California. |
| Pacific Northwest, The | Portland | Oregon. |
| Press and Agriculturist | Riverside | California. |
| Plumas National Bulletin | Quincy | California. |
| Porterville Enterprise | Porterville | California. |
| Redwood City Democrat | Redwood City | California. |
| Salinas Democrat | Salinas | California. |
| Standard and Diggers News | Johannesburg | South Africa. |
| Salt Lake Tribune | Salt Lake City | Utah. |
| Santa Cruz Surf | Santa Cruz | California. |
| Santa Ynez Argus | Santa Ynez | California. |

| Name of Paper. | Place of Publication. | State. |
|---|---|---|
| San Luis Obispo Tribune | San Luis Obispo | California. |
| San José Herald | San José | California. |
| San Benito Advance | Hollister | California. |
| Santa Maria Times | Santa Maria | California. |
| Santa Clara Journal | Santa Clara | California. |
| Selma Irrigator | Selma | California. |
| Sacramento River News | Rio Vista | California. |
| Sonoma County Tribune | Healdsburg | California. |
| Sonoma Democrat | Santa Rosa | California. |
| Sierra Valley Record | Sierra Valley | California. |
| Stockton Record | Stockton | California. |
| Stockton Mail | Stockton | California. |
| Stockton Independent | Stockton | California. |
| St. Helena Star | St. Helena | California. |
| Stanislaus Weekly Record | Modesto | California. |
| Sutter Independent | Yuba City | California. |
| Sutter County Farmer | Yuba City | California. |
| Shasta Weekly Courier | Shasta City | California. |
| Santa Rosa Republican | Santa Rosa | California. |
| Star | Pasadena | California. |
| Searchlight | Redding | California. |
| Town and Country | Sydney | Australia. |
| Tulare County Times | Visalia | California. |
| Tulare Register | Visalia | California. |
| The Architect | San Francisco | California. |
| Union Democrat | Sonoma | California. |
| Union, The | San Diego | California. |
| Vacaville Reporter | Vacaville | California. |
| Valley Record | Ashland | Oregon. |
| Ventura Free Press | Ventura | California. |
| Virginia Chronicle | Virginia City | Nevada. |
| Visalia Delta | Visalia | California. |
| Woodland Daily Democrat | Woodland | California. |
| Watsonville Transcript | Watsonville | California. |
| Weekly Trinity Journal | Weaverville | California. |
| Weekly Standard | Eureka | California. |
| Weekly Palo Alto | Mayfield | California. |
| Weekly Bedrock Democrat | Baker City | Oregon. |
| Weekly Mercury | Oroville | California. |
| Western Watchman | Eureka | California. |
| Willows Journal | Willows | California. |
| Wood River Times | Hailey | Idaho. |
| Western Mining World | Butte | Montana. |
| Yreka Union | Yreka | California. |
| Yreka Journal | Yreka | California. |

## FINANCIAL STATEMENT—JULY 1, 1894, TO JULY 1, 1895.

| | | |
|---|---|---|
| alance on hand July 1, 1894 | | $1,920 81 |
| ureau appropriation, forty-sixth fiscal year | | 10,000 00 |
| eological appropriation, forty-sixth fiscal year | | 15,000 00 |
| aid into Mining Bureau Fund | | 2,361 80 |
| *Contra.* | | |
| alary of State Mineralogist | $3,000 00 | |
| alaries of Geological Assistants | 6,695 70 | |
| raveling expenses of Geological Assistants | 1,958 70 | |
| lerical assistance, geological work | 693 30 | |
| undries, geological work | 1,577 42 | |
| laps | 1,148 60 | |
| ent of Bureau | 2,850 00 | |
| alaries, Bureau | 6,706 00 | |
| ibrary, Bureau | 323 58 | |
| aboratory, Bureau | 131 13 | |
| reight and express, Bureau | 210 34 | |
| linerals and Museum, Bureau | 101 18 | |
| ostage, Bureau | 534 48 | |
| undries, fuel, water, light, etc. | 591 76 | |
| lerical assistance of Bureau | 100 00 | |
| alance forward | 2,660 42 | |
| Totals | $29,282 61 | $29,282 61 |

## FINANCIAL STATEMENT—JULY 1, 1895, TO JULY 1, 1896.

| | | |
|---|---|---|
| alance on hand July 1, 1895 | | $2,660 42 |
| eological appropriation, forty-seventh fiscal year | | 15,000 00 |
| ureau appropriation, forty-seventh fiscal year | | 10,000 00 |
| aid into Mining Bureau Fund | | 1,908 70 |
| ebate on kodaks | | 244 80 |
| *Contra.* | | |
| alary of State Mineralogist | $3,000 00 | |
| alaries of Geological Assistants | 9,426 65 | |
| raveling expenses of Geological Assistants | 4,644 14 | |
| lerical assistance, geological work | 14 15 | |
| reight and express charges, geological work | 25 80 | |
| undries | 544 10 | |
| ent, Mining Bureau | 2,400 00 | |
| alaries, Mining Bureau | 6,606 25 | |
| ibrary, Mining Bureau | 377 55 | |
| aboratory, Mining Bureau | 31 20 | |
| reight and express charges, Bureau | 67 41 | |
| linerals and Museum, Bureau | 59 50 | |
| ostage | 271 00 | |
| undry expenses, fuel, water, light, etc. | 215 28 | |
| lerical assistance, Bureau | 100 00 | |
| alance forward | 2,030 89 | |
| | $29,813 92 | $29,813 92 |

# REPORT OF THE STATE MINERALOGIST.

*To the Trustees of the State Mining Bureau:*

GENTLEMEN: Agreeably to the provisions of "An Act to provide fo the establishment, maintenance, and support of a bureau to be know as the State Mining Bureau," etc., I herewith submit my report for th years 1895 and 1896, which is the thirteenth (third biennial) in th series of the State Mineralogist's Reports.

**Quartz and Drift Mining.**—I am pleased to say that continue activity has prevailed, and still continues, in nearly all lines of th mining industry, with every encouragement for still greater future deve opment. A great deal of capital is seeking investment in legitimat mining enterprises, and it is a matter for congratulation that the citizen of California show confidence in the mines of their own State by investin as liberally as non-residents.

While nearly all other industrial pursuits are stagnant and unprofi able, that of mining seems to have proved profitable and remunerativ during the past few years. Statistics show that of all the industri occupations mining is the most profitable. The average annual produ or earning per capita, in California, of those engaged in farming is abou $300; in manufacturing, including its bounties, about $1,000; in minin with all its burdens and penalties, nearly $1,500; and yet many peop denounce the business of mining as comparatively precarious and unpro itable. The following censuses of 1894 and 1896 of those engaged i mining, milling, quarrying, well-boring, etc., prepared from the repor of our Field Assistants, show an increase of over 40% during the pa two years. It is possible that some hundreds of white men and Chine were not enumerated, inasmuch as many work alone, ground-sluicing rocking in ravines remote from the mines and the roads:

CENSUS OF MINERS, QUARRYMEN, ETC.

| Name of County. | 1893–94. | 1895–96. | |
|---|---|---|---|
| | White Men and Chinese. | White Men. | Chinese. |
| ameda | 356 | 266 | |
| pine | 1 | | |
| mador | 574 | 891 | |
| tte | 427 | 711 | |
| laveras | 776 | 1,198 | |
| lusa | 17 | 26 | |
| ntra Costa | 40 | 114 | |
| l Norte | | 86 | |
| Dorado | 397 | 810 | |
| esno | 256 | 163 | |
| enn | 8 | | |
| umboldt | 169 | 243 | 4 |
| yo | 219 | 240 | |
| ern | 111 | 503 | |
| ake | 228 | 288 | 8 |
| assen | 31 | 47 | |
| os Angeles | 224 | 618 | |
| adera | 149 | 127 | |
| arin | 349 | | |
| ariposa | 79 | 527 | |
| endocino | 12 | 5 | |
| erced | | 7 | |
| ono | 214 | 94 | |
| onterey | 19 | 3 | |
| apa | 411 | 191 | |
| evada | 1,341 | 1,570 | 38 |
| range | 16 | 14 | |
| acer | 767 | 1,047 | 55 |
| umas | 411 | 548 | |
| iverside | 200 | 232 | |
| acramento | 96 | 332 | 174 |
| an Benito | 35 | 38 | |
| an Bernardino | 189 | 256 | |
| an Diego | 315 | 530 | |
| an Francisco | 209 | 105 | |
| an Joaquin | | 27 | |
| an Luis Obispo | 88 | 37 | 8 |
| anta Barbara | 148 | 244 | |
| anta Clara | 804 | 578 | |
| anta Cruz | 209 | 361 | |
| asta | 405 | 1,201 | 12 |
| erra | 630 | 538 | |
| skiyou | 1,569 | 1,469 | 484 |
| olano | 61 | 64 | |
| onoma | 227 | 302 | |
| anislaus | 101 | | |
| ehama | 20 | 56 | |
| rinity | 384 | 767 | 51 |
| ulare | 43 | 55 | |
| uolumne | 420 | 1,058 | |
| entura | 38 | 25 | |
| uba | 72 | 62 | |
| Totals | 13,765 | 18,674 | 834 |
| Grand totals | 13,765 | 19,508 | |

While the total value of all mineral products in California in 1893 as $18,806,261, our Bulletins Nos. 7 and 8, for the years 1894 and 1895, spectively, show a gratifying increase; in the former to $20,203,294 44, nd in the latter to $22,844,644 29. The following table is collated from ne above-named bulletins, which give the production of each substance *y counties:*

MINERAL PRODUCTS OF CALIFORNIA.

| Product. | 1894. | | | 1895. | | |
|---|---|---|---|---|---|---|
| Antimony | 150 tons | | $6,000 00 | 33 tons | | $1,485 00 |
| Asbestos | 50 tons | | 2,250 00 | 25 tons | | 1,000 00 |
| Asphaltum | 11,698 tons | | 233,800 00 | 25,525 tons | | 170,500 00 |
| Bituminous rock | 31,214 tons | | 115,193 00 | 38,921 tons | | 121,586 00 |
| Borax | 11,540,099 lbs. | | 807,807 00 | 5,959 tons | | 595,900 00 |
| Cement | 8,000 bbls. | | 21,600 00 | 16,383 bbls. | | 32,556 00 |
| Chrome | 3,680 tons | | 30,980 00 | 1,740 tons | | 16,795 00 |
| Clays— | | | | | | |
| Bricks | 81,675 M | $457,125 00 | | 131,772 M | $672,360 00 | |
| Pottery uses | 28,475 tons | 35,073 00 | | 37,660 tons | 39,685 00 | |
| | | | 492,198 00 | | | 712,045 00 |
| Coal | 59,887 tons | | 139,862 00 | 79,858 tons | | 193,790 00 |
| Copper | 738,594 lbs. | | 72,486 00 | 225,650 lbs. | | 21,900 50 |
| Gold | | | 13,923,281 89 | | | 15,334,317 69 |
| Granite | 312,365 cu. ft. | | 228,816 00 | 288,449 cu. ft. | | 224,329 00 |
| Gypsum | 2,446 tons | | 24,584 00 | 5,158 tons | | 51,014 00 |
| Infusorial earth | 51 tons | | 2,040 00 | | | |
| Iron ore | 200 tons | | 1,500 00 | | | |
| Lead | 950,000 lbs. | | 28,500 00 | 1,592,400 lbs. | | 49,364 40 |
| Limestone— | | | | | | |
| Lime | 373,500 bbls. | $318,700 00 | | 397,764 bbls. | $386,094 00 | |
| Limestone | 15,420 tons | 19,275 00 | | 71,355 tons | 71,690 00 | |
| | | | 337,975 00 | | | 457,784 00 |
| Macadam | 441,867 tons | | 369,438 00 | 840,650 tons | | 700,987 00 |
| Magnesite | 1,440 tons | | 10,240 00 | 2,200 tons | | 17,000 00 |
| Manganese | 523 tons | | 5,512 00 | 880 tons | | 8,200 00 |
| Marble | 38,441 cu. ft. | | 98,326 00 | 14,864 cu. ft. | | 56,566 00 |
| Mineral paints— | | | | | | |
| Copper | 290 tons | $5,800 00 | | 150 tons | $2,250 00 | |
| Iron | 100 tons | 3,500 00 | | 225 tons | 3,375 00 | |
| Ochre | 220 tons | 4,840 00 | | 375 tons | 2,800 00 | |
| | 610 tons | | 14,140 00 | 750 tons | | 8,425 00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Natural gas— | | | | | | |
| Carbon dioxide | 80,000 | cu. ft. | $4,072 00 | | $12,000 00 | |
| Hydrocarbon | | | 75,000 00 | | 100,000 00 | |
| | | | | 79,072 00 | | 112,000 00 |
| Onyx | 500 | cu. ft. | | 20,000 00 | 1,200 cu. ft. | 12,000 00 |
| Paving-blocks | 2,517 | M | | 66,981 00 | 2,332 M | 73,338 00 |
| Petroleum | 783,078 | bbls. | | 1,064,521 00 | 1,245,339 bbls. | 1,000,235 00 |
| Platinum | 100 | ozs. | | 600 00 | 150 ozs. | 900 00 |
| Quicksilver | 30,416 | flasks | | 934,000 00 | 36,104 flasks | 1,337,131 00 |
| Rubble rock | 219,933 | tons | | 295,400 00 | 414,038 tons | 394,952 00 |
| Salt | 49,131 | tons | | 140,087 00 | 53,031 tons | 150,576 00 |
| Sandstone | 79,125 | cu. ft. | | 30,792 00 | 55,242 cu. ft. | 35,373 00 |
| Sandstone concrete | 18,000 | tons | | 82,800 00 | | |
| Serpentine | | | | | 4,000 sup. ft. | 4,000 00 |
| Soapstone | | | | | 25 tons | 375 00 |
| Silver | | | | 297,331 55 | | 599,789 70 |
| Slate | 1,800 | squares | | 11,700 00 | 1,350 squares | 9,450 00 |
| Soda | 1,530 | tons | | 20,000 00 | 1,900 tons | 47,500 00 |
| Total | | | | $20,203,294 44 | Total | $22,844,664 29 |

While gold still continues to be by far our largest mineral product the annual value of our non-metallic substances has now reached $1,348,280; hydrocarbons and gases, $1,404,321, and structural materials, $2,713,755. It is worthy of note that in addition to the precious metals there were 36 other mineral substances produced. From the above table it is evident that the great increase was due to the mining of precious metals.

The attention of investors has not been attracted to any one particular section, but every gold-producing county shared in the general prosperity. Trinity and Shasta counties on the north have been particularly favored by large investment of foreign capital, and the operations of the Mountain Mines Company (Limited) have directed the attention of prospectors and others to copper, and its exploitation is again becoming quite general. The Mother Lode belt, which extends through a number of counties in the State, has become a favorite field for investors in gold bearing properties, and some gigantic operations are in progress and contemplation. The demand for the Bureau's geological map of the Mother Lode exhausted the supply, and a new and corrected edition was issued last spring. All mineral patents granted to January 1st of this year, and so much of the "Mariposa grant" as could be delineated upon the map without changing its form, have been added. There have been numerous "Mother Lode maps" issued within the past year by private parties, but the demand for our map continues.

So great an interest has been taken in the subject of the Mother Lode that the lectures of our Curator, Henry S. Durden, and H. W. Fairbanks, Ph.D., drew respectively large audiences. Mr. Fairbanks has kindly revised his notes, and his very interesting and useful paper "Ore Deposits with especial reference to the Mother Lode," is printed in the latter part of this volume. The close study Mr. Fairbanks has given to this subject while in the employ of the Bureau makes him an authority, and his paper valuable. South of Tehachapi the same general interest prevails. In Kern County, 45 miles east of Mojave, a new district was formed during the winter of 1895–96, and some very promising ledges located. If the ledges hold with depth, Randsburg will become an important mining center, although it experiences serious drawbacks in scarcity of both water and fuel. The outlook for Riverside, San Bernardino, and San Diego counties is promising, and the last of the three boasts of having a mill (Golden Cross) containing the greatest number of stamps (100) under one roof in the State, although the total plant (140 stamps) is equaled by the Utica-Stickle.

Particular attention is called to the list of mills inserted at the end of each county under the head of "Gold," which has been prepared from the notes of our Field Assistants.

**Hydraulic Mining.**—Aside from Del Norte, Humboldt, Siskiyou, and Trinity counties, where there are no restrictions on hydraulic mining, it has been prosecuted in a comparatively small way by many companies and individuals, but their production of gold has helped to swell the total in no inconsiderable degree. The following list of applications (115) to mine by this method on the tributaries of the Sacramento and San Joaquin rivers have been granted by the U. S. Debris Commission *since* the list of 42 published in our last Report. There have been 233 applications, and 157 have been granted; the others are either pending or have been rejected:

## HYDRAULIC MINES WORKING UNDER PERMISSION FROM THE U. S. DEBRIS COMMISSION.

| Name of Mine. | Near. | County. | Applicant. | Mine Drains Into Tributary of— | Permit Granted. |
|---|---|---|---|---|---|
| 1. Adkins | Ono | Shasta | Alonzo Engle | | Jan. 20, 1896 |
| 2. Agate | Howard Creek | Sierra | A. Denmire | North Yuba | Nov. 20, 1894 |
| 3. Argentine | Downieville | Sierra | H. H. Meyer et al. | Yuba | Nov. 11, 1895 |
| 4. Badger Hill | Spanish Ranch | Plumas | A. B. Jacks et al. | Feather | Jan. 13, 1896 |
| 5. Blackhawk | Placerville | El Dorado | Eugene Piaggi | American | Nov. 18, 1895 |
| 6. Blue Gravel Placer | Sutter Creek | Amador | W. H. Glenn et al. | Mokelumne | Jan. 13, 1896 |
| 7. Bobby Burns | Placerville | El Dorado | Hy Niedecker et al. | American | Nov. 18, 1895 |
| 8. Brandy City | Brandy City | Sierra | A. Steinberger | Middle Yuba | Oct. 9, 1894 |
| 9. Canada | Port Wine | Sierra | O. F. Caya et al. | Yuba | Nov. 18, 1895 |
| 10. Cascade | Beckwith | Plumas | Cascade W. & Mining Co. | Feather | Dec. 2, 1895 |
| 11. Central Hill | Douglas Flat | Calaveras | W. Thomas et al. | Stanislaus | June 21, 1895 |
| 12. Chaparral Hill Gold Gravel | Onion Valley | Plumas | Ed. Bryan et al. | Feather | Dec. 16, 1895 |
| 13. Charcoal Ranch | Sierra City | Sierra | L. F. Fourier et al. | Yuba | July 23, 1895 |
| 14. China Hill | Volcano | Amador | Con. Amador & Volcano Mining Co. | Mokelumne | Nov. 23, 1894 |
| 15. Clay Bank | Meadow Valley | Plumas | H. A. Hallstead | Feather | Jan. 13, 1896 |
| 16. Cleveland | Scales Diggings | Sierra | D. Perkins | North Yuba | Nov. 27, 1894 |
| 17. Cole | Grizzly Flat | El Dorado | W. H. Cole | Cosumnes | Dec. 23, 1895 |
| 18. Coney | Ono | Shasta | G. M. Coney et al. | Sacramento | Mar. 17, 1896 |
| 19. Con. Sailor Creek Placer | Garden Valley | El Dorado | G. W. Davey | American | Nov. 18, 1895 |
| 20. Corkscrew Placer | Spanish Ranch | Plumas | S. F. Toland et al. | Feather | Sept. 2, 1895 |
| 21. Crown Point | Goodwin | Plumas | Crown Point Mining Co. | Feather | April 15, 1895 |
| 22. Dry Gulch | Volcano | Amador | O. M. Henry | Dry Creek | May 25, 1895 |
| 23. Dutch | La Porte | Plumas | S. Chapman | Yuba | Nov. 18, 1895 |
| 24. Dutra, Wilder & Co. | Dobbins Ranch | Yuba | Louis Wilder | Yuba | Feb. 5, 1895 |
| 25. Eagle Mining Claim | Sutter Creek | Amador | Lorenzo Canata et al. | Mokelumne | Nov. 4, 1895 |
| 26. El Dorado Placer | Garden Valley | El Dorado | W. Bacchi et al. | American | April 22, 1895 |
| 27. Ellen Taylor | Fairplay | El Dorado | Cy. Mulkey | Cosumnes | July 27, 1896 |
| 28. Emma Harding | Taylorsville | Plumas | J. E. Evans | Feather | Jan. 13, 1896 |
| 29. Epley | Placerville | El Dorado | L. Rolland et al. | American | May 28, 1895 |
| 30. Eureka Hydraulic | Placerville | El Dorado | J. Pascoe | American | Sept. 30, 1895 |
| 31. Farrel | Columbia Hill | Nevada | Eureka Lake & Yuba Canal Co. | Yuba | Nov. 18, 1895 |
| 32. Fine Gold | Vallecito | Calaveras | G. A. Meinecke | Stanislaus | June 22, 1895 |
| 33. Forest Home | May | Amador | W. A. Roberts et al. | Cosumnes | Dec. 23, 1895 |
| 34. Forty-nine Flat | Volcano | Amador | Hadey & Bolles | Mokelumne | June 30, 1895 |
| 35. Galena Hill | Camptonville | Yuba | W. R. Williams et al. | Yuba | Nov. 25, 1895 |
| 36. Garfield Flat | Johnsville | Plumas | P. Lorenzo | Feather | Nov. 6, 1895 |
| 37. Goodman & Bund | Volcano | Amador | Goodman & Bund | Mokelumne | Mar. 23, 1895 |
| 38. Goodman Brothers | Volcano | Amador | Goodman Brothers | Mokelumne | May 2, 1895 |

HYDRAULIC MINES WORKING UNDER PERMISSION FROM THE U. S. DEBRIS COMMISSION—Continued.

| Name of Mine. | Near. | County. | Applicant. | Mine Drains Into Tributary of— | Permit Granted. |
|---|---|---|---|---|---|
| 39. Gold Deposit | Kelsey | El Dorado | D. Croft | American | Jan. 16, 1896 |
| 40. Gorman | Michigan Bluff | Placer | H. L. Van Emon | American | Mar. 30, 1896 |
| 41. Grizzly Bear | Johnsville | Plumas | N. Rossi | Feather | Nov. 6, 1895 |
| 42. Halloway | Hopkins Creek | Plumas | J. S. Gould et al. | Feather | Nov. 20, 1894 |
| 43. Hard Times | Bath | Placer | J. Hoffman et al. | American | April 22, 1895 |
| 44. Hidden Treasure | Pine Grove | Amador | Bear Bar Mining Co. | Mokelumne | Mar. 30, 1896 |
| 45. Homestake | Sierra City | Sierra | C. Wickman et al. | Feather | Sept. 28, 1895 |
| 46. Independence | | Yuba | J. A. Broyles | Yuba | Mar. 17, 1896 |
| 47. Iowa | Forest Hill | Placer | W. Henning et al. | American | May 25, 1895 |
| 48. Irish Hill | Oleta | Amador | G. W. Smith | Mokelumne | Dec. 23, 1895 |
| 49. J. C. Day | Georgetown | El Dorado | J. C. Day | American | May 30, 1896 |
| 50. James Watson | Igo | Shasta | J. C. Voluntine | Sacramento | Mar. 23, 1895 |
| 51. Jaybird | Camptonville | Yuba | J. E. Raum | Yuba | Jan. 20, 1896 |
| 52. Joubert | Camptonville | Sierra | F. Joubert | Yuba | July 15, 1895 |
| 53. Kanaka Flat | Spanish Ranch | Plumas | W. Wampler | Feather | Jan. 20, 1896 |
| 54. Kate Gray | Volcano | Amador | Giovanni Rossi | Mokelumne | May 30, 1895 |
| 55. Kentucky Flat | Georgetown | El Dorado | H. E. Pickett | American | Dec. 23, 1895 |
| 56. Kerr | Yankee Jim's | Placer | J. G. De Bons | American | Mar. 30, 1896 |
| 57. King Sayre | Gibsonville | Sierra | W. A. Schofield et al. | Yuba | Nov. 18, 1895 |
| 58. Last Chance | Placerville | El Dorado | Ed. Hancock et al. | American | June 10, 1895 |
| 59. Last Chance | Sierra City | Sierra | H. Goering | Feather | July 29, 1895 |
| 60. Leroy Hedge | Brownsville | Yuba | Leroy Hedge | Yuba | May 8, 1895 |
| 61. Lewis | Spanish Ranch | Plumas | Fred Lewis | Feather | Nov. 18, 1895 |
| 62. Lone Star Placer | Cromberg | Plumas | W. De Vinny | Feather | Oct. 14, 1895 |
| 63. Lost Camp | Blue Cañon | Placer | J. Rathburn et al. | American River | Dec. 16, 1895 |
| 64. Manzanita | Sweetland | Nevada | Kate Hayes Mining Co. | Yuba | Oct. 28, 1895 |
| 65. Marlow | Sonora | Tuolumne | A. P. Scheld | Tuolumne | July 27, 1896 |
| 66. Martelle | Salmon Falls | El Dorado | L. Dormody | American | Feb. 18, 1895 |
| 67. Martin Hydraulic | Placerville | El Dorado | C. W. & W. W. Martin | American | Mar. 30, 1895 |
| 68. Meehan Placer | Aqueduct | Amador | J. Meehan | Sacramento | Nov. 30, 1896 |
| 69. Michigan Hill | Quincy | Plumas | J. Higgins | Feather | Dec. 2, 1895 |
| 70. Mill Gulch Gravel | Amador City | Amador | H. M. Dickerman et al. | Cosumnes | Mar. 30, 1896 |
| 71. Miocene | Crescent Mills | Plumas | C. G. Hepler | Feather | Dec. 30, 1895 |
| 72. Mitchell Hydraulic | Placerville | El Dorado | R. Blair et al. | American | Jan. 22, 1895 |
| 73. Mohawk | Johnsville | Plumas | F. Sorocco | Feather | Mar. 30, 1896 |
| 74. Mt. Gregory Gold | Georgetown | El Dorado | P. Phillips | American | Dec. 1, 1895 |
| 75. Mugginsville | Eureka North | Sierra | W. A. Morse | North Yuba | Nov. 11, 1895 |
| 76. Nellie Bly | Igo | Shasta | A. A. Ludwig et al. | Sacramento | April 6, 1896 |
| 77. Nip and Tuck | Bangor | Butte | Dickhouse Brothers | Feather | Oct. 2, 1894 |
| 78. No Chunk | Michigan Bluff | Placer | E. S. Thompson et al. | American | May 30, 1896 |
| 79. Northern Placer | Cromberg | Plumas | F. Traynor | Feather | Nov. 5, 1894 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 81. North Rim | Yankee Jim's | Placer | G. H. Pease et al. | American | Feb. | 26, 1895 |
| 82. Omega | Omega | Nevada | M. C. Tully | South Yuba | Nov. | 11, 1895 |
| 83. Pacific | St. Louis | Sierra | D. Conlan | Yuba | Nov. | 18, 1895 |
| 84. Pineleaf | Spanish Ranch | Plumas | J. Schafer | Feather | Dec. | 23, 1895 |
| 85. Plumas Blue Gravel | Nelson Point | Plumas | Plumas Blue Gravel Mining Co. | Feather | Dec. | 30, 1895 |
| 86. Plumas Imperial | Quincy | Plumas | Plumas Imperial Gravel Mining Co. | Feather | July | 8, 1895 |
| 87. Poor Man's Hydraulic | Placerville | El Dorado | C. Jordan | American | Dec. | 16, 1895 |
| 88. Princess | Redding | Shasta | O. H. Simons | Sacramento | Mar. | 30, 1896 |
| 89. Proper | Murphy | Calaveras | J. Sybel | Stanislaus | Mar. | 17, 1896 |
| 90. Quaker Hill | Nevada City | Nevada | G. C. Sargent | Yuba | Dec. | 30, 1895 |
| 91. Raffetto Placer | Placerville | El Dorado | G. Raffetto | S. F. of American | July | 20, 1896 |
| 92. Railroad Hill Gravel | Fourth Crossing | Calaveras | L. G. De Martini | Calaveras | Dec. | 24, 1895 |
| 93. Red Hill and Telegraph Hill | Rancheria | Amador | M. Fitzgerald et al. | Mokelumne | July | 21, 1895 |
| 94. Reese | Redding | Shasta | G. Reese | Sacramento | Jan. | 6, 1896 |
| 95. Richmond Hill | La Porte | Plumas | Good Hope Mining Co. | Feather | Nov. | 18, 1895 |
| 96. Roman | Taylorsville | Plumas | John Smith | Feather | Jan. | 13, 1896 |
| 97. Roomie | Sierra City | Sierra | L. Logemacini | Yuba | July | 29, 1895 |
| 98. Sailor Boy | Brandy City | Sierra | M. Cortez | Yuba | Aug. | 5, 1895 |
| 99. St. Lawrence | Moore's Flat | Nevada | Ah Wing | Yuba | Oct. | 28, 1895 |
| 100. Shealor | Volcano | Amador | J. E. Newson | Mokelumne | Mar. | 18, 1895 |
| 101. Sherwood & Snyder | Chinese Camp | Tuolumne | L. M. Sherwood et al. | Tuolumne | Jan. | 13, 1896 |
| 102. Spanish John | Rough and Ready | Nevada | J. Black | Yuba | Dec. | 17, 1894 |
| 103. Steele & Co. | Brownsville | Yuba | J. H. Steele | Yuba | Sept. | 25, 1894 |
| 104. Strawberry Placer | Vallecito | Calaveras | J. Enos | Stanislaus | May | 31, 1895 |
| 105. Terry Hill | Spanish Ranch | Plumas | E. H. Hard | Feather | Oct. | 14, 1895 |
| 106. Tiedeman | Georgetown | El Dorado | H. E. Pickett | American | Nov. | 18, 1895 |
| 107. Tiger | Forest Hill | Placer | J. Ward et al. | American | May | 13, 1895 |
| 108. Tippecanoe | Pike City | Sierra | G. Parent | Yuba | Oct. | 28, 1895 |
| 109. Trafton | Yankee Jim's | Placer | J. N. Findlay | American | Mar. | 30, 1896 |
| 110. Try Again Hydraulic | Placerville | El Dorado | G. Varozza | American | July | 20, 1896 |
| 111. U. S. Grant | Blue Tent | Nevada | E. P. Hagar | South Yuba | Jan. | 1, 1895 |
| 112. Volcano Gold Gravel | Volcano | Amador | Volcano Gold Gravel Mining Co. | Mokelumne | Dec. | 16, 1894 |
| 113. Willow Placer | | Sierra | N. B. Willets et al. | Yuba | Sept. | 2, 1895 |
| 114. York Mining Co. | Brownsville | Yuba | York Mining Co. | Yuba | May | 15, 1895 |
| 115. Zantgraf & Closs | | El Dorado | J. Zantgraf et al. | American | April | 29, 1895 |

Whole number of applications made ..... 233
Number of permits granted prior to August 14, 1891 ..... 42
Number of permits granted since that date ..... 115

Total number granted ..... 157

On June 11, 1896, Congress passed the Sundry Civil Service bi
which contained an item appropriating $15,000 to defray the expens
of the California Debris Commission, so that assurance is given for th
continuance of this Commission for another year.

**Product of Precious Metals.**—To those who have not received n
seen our Bulletins Nos. 7 and 8, the following table will prove inte
esting, and show at a glance the production of and the increase
decrease, by counties, of the precious metals:

GOLD AND SILVER PRODUCT OF CALIFORNIA.

| County. | 1894. | | | 1895. | | |
|---|---|---|---|---|---|---|
| | Gold. | Silver. | Totals. | Gold. | Silver. | Totals. |
| Amador | $1,331,916 54 | $280 27 | $1,332,196 81 | $1,391,929 40 | $1,089 00 | $1,393,018 40 |
| Butte | 473,672 65 | | 473,672 65 | 697,260 85 | 8,935 53 | 706,196 38 |
| Calaveras | 2,119,365 67 | 5,182 80 | 2,124,548 47 | 1,717,916 14 | 77 00 | 1,717,993 14 |
| Del Norte | 8,000 00 | | 8,000 00 | 8,250 00 | | 8,250 00 |
| El Dorado | 366,707 67 | 356 00 | 367,063 67 | 700,101 31 | 447 68 | 700,548 99 |
| Fresno | 8,202 00 | | 8,202 00 | 47,249 00 | | 47,249 00 |
| Humboldt | 41,326 00 | 13 86 | 41,339 86 | 92,635 20 | | 92,635 20 |
| Inyo | 52,638 91 | 83,640 00 | 136,278 91 | 92,142 28 | 188,329 23 | 280,471 51 |
| Kern | 310,706 91 | 39,700 00 | 350,406 91 | 231,433 31 | 46,064 28 | 277,497 59 |
| Lassen | 35,283 00 | | 35,283 00 | 25,000 00 | | 25,000 00 |
| Los Angeles | 34,500 00 | | 34,500 00 | 23,330 00 | | 23,330 00 |
| Madera | 167,791 60 | 180 00 | 167,971 60 | 162,323 74 | | 162,323 74 |
| Mariposa | 153,707 51 | 38 75 | 153,746 26 | 216,622 39 | 7 07 | 216,629 46 |
| Merced | 762 50 | | 762 50 | 1,500 00 | | 1,500 00 |
| Mono | 358,824 46 | 11,549 12 | 370,373 58 | 552,690 54 | 84,910 37 | 637,600 91 |
| Monterey | 8,000 00 | | 8,000 00 | | | |
| Nevada | 1,830,154 80 | 475 51 | 1,830,630 31 | 1,789,815 66 | 400 00 | 1,790,215 66 |
| Orange | | | | 144 00 | | 144 00 |
| Placer | 1,851,214 52 | 664 37 | 1,851,878 89 | 1,599,634 79 | 5,272 53 | 1,604,907 32 |
| Plumas | 499,358 83 | | 499,358 83 | 602,951 05 | 271 52 | 603,222 57 |
| Riverside | 93,322 50 | | 93,322 50 | 285,106 00 | 2,550 00 | 287,656 00 |
| Sacramento | 70,326 00 | | 70,326 00 | 145,872 75 | | 145,872 75 |
| San Bernardino | 130,419 78 | 148,242 89 | 278,662 67 | 131,360 00 | 219,410 30 | 350,770 30 |
| San Diego | 266,408 73 | 189 60 | 266,598 33 | 344,307 57 | 600 00 | 344,907 57 |
| San Luis Obispo | 1,200 00 | | 1,200 00 | 3,000 00 | | 3,000 00 |
| Santa Barbara | | | | 4,000 00 | | 4,000 00 |
| Shasta | 617,436 68 | 5,032 31 | 622,468 99 | 781,696 32 | 28,417 20 | 810,113 52 |
| Sierra | 604,721 54 | | 604,721 54 | 694,469 67 | 106 96 | 694,576 63 |
| Siskiyou | 760,781 83 | | 760,781 83 | 950,006 43 | 177 30 | 950,183 73 |
| Stanislaus | 26,368 50 | | 26,368 50 | 26,481 50 | | 26,481 50 |
| Trinity | 1,012,665 84 | 325 00 | 1,012,990 84 | 1,166,745 13 | 1,257 28 | 1,168,002 41 |
| Tuolumne | 547,448 06 | 1,072 16 | 548,520 22 | 666,754 15 | 312 62 | 667,066 77 |
| Tulare | | | | 16,320 00 | | 16,320 00 |
| Yuba | 107,480 20 | | 107,480 20 | 111,482 34 | | 111,482 34 |
| Unapportioned | 32,568 66 | 388 91 | 32,957 57 | 53,786 17 | 11,153 83 | 64,940 00 |

**Petroleum.**—Had the same price for petroleum prevailed in 1895 as in 1894 and 1896, the value of this product would have placed it second in value in the list of mineral productions. Very early in the present year the price increased at Los Angeles as much as 50 cents per barrel, and the total given in our Bulletin No. 8 would have been increased at least $489,897 50. There is quite a little excitement in several portions of the State over the prospecting for petroleum and natural gas, notably so near Cholame Valley, in San Luis Obispo County; near Coalinga, in western Fresno County; near Livermore, Alameda County; on Louterwasser Creek, Contra Costa County; and in the Reche and San Timoteo cañons, in San Bernardino County, where it is reported some oil has recently been found. Fuller reference to this subject will be found in the body of the report, under the head of "Petroleum." A small refinery of 1,000 gallons per day capacity has been erected in Fresno since the visit of our Field Assistant, and a larger one is contemplated.

**Tin.**—Numerous prospectors in Modoc and Shasta counties seem determined to find tin there. A number of samples of the rock and some "buttons" have been received and tested at the Bureau, and invariably the so-called "tin" proved to be finely disseminated iron.

**Reports.**—The same plan in the arrangement of subjects has been retained for this as was devised and carried out in our XIIth Report. The method of arranging subjects, counties, mines, etc., in alphabetical order has made it a very simple matter to quickly find any particular subject or mine, and has given general satisfaction. Some persons, however, object to the brevity of the paragraphs descriptive of mines, and particularly to back references. They point to the fact that the bulky VIIIth and Xth Reports, now out of print, are highly prized, but these critics do not reflect that the general public does not want a repetition, but only up-to-date information; besides, the increased cost to the State for printing this old matter would amount to a very large sum. As before, the Field Assistants were instructed to make their reports complete but concise. Their manuscript has been carefully corrected, condensed, and even rewritten several times. It is believed that it cannot be further reduced without detracting from its usefulness. The demand for our XIIth Report exhausted the edition of six thousand within six months after its appearance, and double that number could have been distributed had we had them on hand. A great many importuned us to have it reprinted, but, as before stated, the very great expense prohibited it. Hereafter we will ask to have all our reports and bulletins stereotyped so that future demands may readily be supplied. Our stock of other reports is also exhausted, except that of the IXth (1889) and XIth (1892), and these may be obtained upon application. Those from abroad desiring our reports to obtain an idea of our resources, and not for the technical papers contained therein, have been and will continue to be supplied gratuitously upon the receipt of the proper amount to defray postage. Our postage account, as seen from our Secretary's report, and which formerly amounted to quite a large sum, has been greatly reduced by requiring parties within the State to remit the necessary amount, and I am pleased to say that they cheerfully approve of the rule, which was made necessary by the rapidly diminishing income of the Bureau Fund.

As mining is the most flourishing and one of the most importar industries of our State, it has been suggested that the Report of th State Mineralogist be issued annually instead of biennially. The inte ests of the miners and contemplating investors demand that th descriptions of the mines be issued as early as possible in order to sup ply the necessary information.

**Appropriations.**—With our present appropriation it is impossibl for our Field Assistants to visit *all* portions of the State *each* year, an consequently we are not able to give as complete descriptions at the tim of going to press as is desirable. If the appropriation were larger, mo men could be kept in the field, all portions of the State visited, and th descriptions of the mines be issued as bulletins. Should the appropri tion remain the same as at present, and it were possible, *sixty per ce* of the two years' appropriation should be available during the first yea in order that more field work might be accomplished during the summe months. After the Report has been prepared for the State Printer (Se tember 15th of the second fiscal year), five or six months intervene befo the men again take the field. Summer and fall months are the best fo field work, and during these times it should be rushed, although durin the past winter the men were kept in the field nearly all the time, owin to its very open character, and when they came in they were employe several months at the Bureau in writing up their notes.

If possible, this Bureau should be placed upon a permanent basis i regard to funds, the same as the University, etc., in order to produ work of a superior character. As long as it leads an ephemeral lif existing from Legislature to Legislature, it is impossible to undertal certain lines of scientific work that the character of the institutic demands, and which might otherwise be stopped, if commenced, throug lack of funds.

**Bureau Fund.**—The Bureau does not receive any benefit from th "stock certificate tax," except from the City and County of San Fra cisco. The Secretary of State has kindly furnished us with a list mining and kindred incorporations for each county, and we have se them, together with a copy of the law, to the Assessor of each count with the request that he attend to this duty and collect the tax. O of your Board, Mr. Thomas B. Bishop, suggested a very feasible pl which will remedy this evil to a great extent, to wit: Let stamps simil to Internal Revenue stamps be printed and sold by the State Controlle or proper authority, to mining and kindred incorporations, and then t Secretary of every company should be compelled by law to affix one these stamps to every certificate of stock issued or transferred; the amou paid for these stamps to be placed to the credit of the Bureau in t State Treasury.

**County Resources.**—As a means of advertising the mineral r sources of each county separately, it has been suggested that the conte of this Report be segregated by counties, and a limited number—say, o thousand—be printed and sent to the Supervisors of each county f general distribution. It brings each county's resources *directly* to t attention of the parties desired, and avoids comparison with oth counties, as is sometimes the case when the complete Report is sent.

Geological Survey.—California has done but little in the way of a ological survey. By Acts of the Legislature in 1853 and subsequently, eological examinations" were ordered, and Dr. John B. Trask, the st State Geologist, placed in charge, and who made four reports. In 60, by an Act of the Legislature, the first actual geological survey was stituted, and Prof. J. D. Whitney, the second State Geologist, placed charge of it. While he gathered and published a large amount of eful information, he was not particularly fortunate in his methods of rrying on the work. At all events, the survey was suddenly discon- nued before it had accomplished the practical and economical results ped for it by the mining community. In 1880, in response to a deeply t need for information bearing on the mineral resources of the State, e State Mining Bureau was established.

Among other things, the original Act provided for the collection and udy of "specimens of all the geological and mineralogical substances, cluding mineral waters and building-stones, found in the State, pecially those presenting economic or commercial value." Since the tablishment of the Bureau, and especially in the last eight years, ring which time the State has been liberal in granting appropria- ns, some geological work of a *reconnoissance character* has been carried in addition to the investigations which bear more directly on gold ning.

It has been felt, however, for some time, that as the Bureau is organ- d, neither the mining work nor that in geology can be carried on to e best advantage together and by the same assistants. The work in ning, with the growing details of the present day, needs men espe- lly trained in all the aspects of that important industry. So it is o with the lines of geological investigation; the time was when the ence was much less complicated and a man could be not only an pert in all the problems then connected with mining, but also a prac- al geologist. Now the best results can only be reached by men ined each in his own special line, and while the two subjects of logy and mining are in certain respects intimately related, yet in ers they are widely separated.

Consequently, it has been thought best to recommend, for the fullest iciency of the State Mining Bureau, that the work of mining proper separated from that of geology; that the former be devoted mainly to examination of mines and the gathering of statistics relating to them. this work only the most experienced assistants, *mine inspectors*, uld be employed and given power by law to enter all mines, report on their condition, and enforce, where needed, better and safer work- methods. This would prove a direct benefit and safety to the work- miner and a protection to the stockholder and investor. Only a few the mines, and they may be counted upon one's fingers, have refused mission to our Field Assistants. Some of these mines have since ved questionable, and it is probable that none of them would bear a se scrutiny.

It is further proposed that the work in geology be organized, in the m of a geological survey, as a department of the Mining Bureau, and ve an experienced geologist in charge.

In the establishment of separate investigations in geology, it is neces- y to call attention to some of the great advantages to the State

from an economical standpoint of taking up this work in a thorou manner.

California has great area, its mineral resources are numerous and varie and if there is any portion of the United States where it can be co sidered of economic importance to undertake a geological survey, certainly must be here.

The value of a geological survey as a basis for the development of t mineral resources of a country is attested by the fact that all civiliz countries either have or are now engaged in this kind of research.

A preliminary geological and mineralogical map of the State w issued by the Bureau in 1890. In many respects this was a valuab production, representing our best knowledge at that time. The progre of geological knowledge has been so rapid since then that it certain will not redound to the credit of the State if the map is allowed to sta as an example of its highest ability in this line. To undertake a revi ion of this map, based upon accurate detailed work, should not delayed if the State would maintain the character of its scientific wor

The scope of a geological survey must be broad in order to secure t most important economic returns, and should embrace the followi main lines of investigation:

1. The preparation of a topographical contour map in the form atlas sheets. This can, without doubt, be arranged so as to be carri on with the assistance of the topographical division of the U. S. Ge logical Survey, that survey paying half of the expense. These ma are of the highest practical value in many ways, besides being necessa for accurate geological mapping.

2. The mapping of the geological formations in important loc areas, finally spreading over the whole State not covered by the U. Geological Survey. Accurate discrimination of the different formatio and their structural relations is of the highest possible value, partic larly in the examination for coal, oil, amount and character of t water-supply, etc. It is also of importance in distinguishing meta liferous areas from those not metalliferous, and determining the cha acter and extent of such deposits.

3. The systematic collection of representative specimens of the mi erals and rocks of the different formations in the districts examine With but slight extra expense duplicate collections can be made for t High Schools of the State, a course which would be of great education value and of importance, especially in communities interested mining.

4. A study of the building-stones, their character and accessibilit In this line the need is most pressing, in view of the great increase the use of stone.

5. A description of the mineral springs, and analyses of th waters. This is a subject which should also be included in a geologic survey, and would be of incalculable benefit.

6. The dissemination of the principles of geology and mineralo among the people of California, especially the prospectors a investors, enabling them to avoid many mistaken and useless explo tions.

Some have thought that, as the U. S. Geological Survey is carryi on mapping in portions of the State, it is unnecessary that the Sta undertake any work of the same kind. The arguments against the Sta

ing up this work to the U. S. Geological Survey are numerous and ighty. The following are some of the more important ones:

The results of the Survey are not published until several years after e work has been done, and are not then accessible to the masses of e people. Its publications, with the exception of the annual reports, e not for free distribution, and, as a matter of fact, almost none of se reach the masses of the people who really need the knowledge.

One of the most important results of a State survey is the gathering ether at some accessible point, in a museum, of a classified collection the minerals and rocks, so that people can study them. If this work eft to the U. S. Geological Survey, the collections all go to Washington, ere they are practically inaccessible to citizens of California. State de should not allow the work to be done alone by the United States vernment, particularly when the State reaps so little benefit from it. e Mining Bureau has made a good beginning, but there is a vast ning for enlarged usefulness in this line.

A large amount of geological work of a general reconnoissance charac- has already been done, and a systematic survey could be taken up a most economical manner at the present time. Because of what has eady been done, the reports of the survey could be devoted to careful estigation in individual districts, and to the preparation of special nographs upon coal, iron, stone, etc.

There can be no doubt that if a geological survey is undertaken along lines and with the methods of modern research, very valuable ults will accrue to the State. A wider knowledge and appreciation the principles of structural geology would direct exploitation in the ht direction, and save much disappointment. The Mining Bureau already fitted with a laboratory which, with comparatively little ense, could be arranged for the use of the survey.

Work could be begun with a modest appropriation, and when the vey has shown its right to live by its usefulness, the appropriation ld be increased with a proportionate benefit.

**Hydrography.**—The streams of our State afford an immense amount ower which is practically unutilized as yet. Our industrial progress ht be materially promoted were these streams regularly gauged and r average and minimum stages noted. At present the waters of the erican and San Joaquin rivers, and of some of the smaller streams, utilized for generating electrical power, and all of them could be ized several times over for the same purpose.

oo much importance cannot be given to this subject, and the con- s of this volume, under the head of "Mining and Irrigating Canals, esian Wells, etc.," will afford a slight basis for a beginning. Unfor- ately, the valuable data collected some years ago by the State gineering Department is not now available.

**Department of Mines.**—It is confidently believed that the mineral ustries of the whole country would be greatly promoted should a artment of Mines be created in the United States Government. The eral output, for 1895, of all the States amounted to $622,230,723, it seems almost incredible that such an important industry should ithout representation in the Cabinet. The various bureaus relating mining are scattered through the several existing departments, and

as a matter of economy, as well as a means of stimulating and encou aging fuller and more systematic development and research, such department should be created. Properly it should embrace Archæolog Botany, Ethnology, Geography, Geology, Irrigation, Mining, Palæont ogy, etc.

**Official Visits.**—On January 23d and 24th of this year our Ch Executive, Governor James H. Budd, honored us with his presence a displayed a commendable and an intelligent interest in all of t departments. He appeared well pleased with the condition and t manner of conducting the affairs of the Bureau, and we are led believe that he will lend his aid toward improving it when need He is the third Governor to inspect this Bureau.

**Bulletins.**—The bulletins issued by this Bureau have been m favorably received, and the demand for them from nearly every St in the Union and every country in the world is phenomenal. The *Mi Timbering*, the *Cyanide*, and the *Mill Practices* bulletins have be copied and printed entire, with all the illustrations, in the Mining a Scientific Press of San Francisco, the Scientific American Supplement New York, the London Mining Journal, the Australian Mining Stand of Sydney and Melbourne, and the Canadian Mining Review of Montre besides, very full excerpts have appeared in papers all over the wo There will have been issued during the present administration ten bu tins, as follows:

*Bulletin No. 2—Mine-Timbering*, by W. H. Storms.—As intimated our last Report, the edition of 5,000 was speedily exhausted, and a sec edition early in 1895 became imperative. The author rewrote a la part of it and made important additions thereto. It continues to eagerly sought for, and as it has now been stereotyped, future dema may be cheaply and quickly supplied.

*Bulletin No. 3—The Gas and Petroleum Yielding Formations of Great Valley of California*, by W. L. Watts.—This work has met w unqualified approval, but dealing purely with a local subject, it has been so much in demand as others of the series. Recently there been quite a demand for it by the citizens of Fresno, Merced, S Benito, Santa Clara, and other valley counties, in consequence of petroleum developments near Coalinga and elsewhere.

*Bulletin No. 4—Catalogue of California Fossils* (Parts II, III, and V), by Dr. J. G. Cooper.—This book contains papers relating the Palæontology of California, and may be considered supplement to the volumes on that subject published by the State Geological S vey under Prof. J. D. Whitney, as well as to Part I of the Catalogu California Fossils, published in our VIIth Annual Report. An edi of 2,500 was printed, and a demand from scientists and scientific bo has been proportionately large.

*Bulletin No. 5—The Cyanide Process, Its Practical Application Economic Results*, by Dr. A. Scheidel, E.M.—This work has had unprecedented run, and a second edition became necessary and was iss a few months ago. As precautions had been taken to have it ste typed, the issuing of a second edition was a very simple matter. the standard work on this subject the world over, and the parent c pany controlling the cyanide plants pought them by the dozen to p

the hands of their chiefs of staff. It is so well thought of that we ıve received very flattering offers from famous booksellers for the ency and sale of the work, but the State not being in the business for ofit we could not offer them any inducements, and declined their offers. s popularity continues, and a third edition will become necessary thin a year or two.

Cyanide plants have not become numerous in this State from the fact at but very few tailings were preserved and retained. It is undoubtly true that nearly as much gold as was saved in the mills was coined in the tailings which passed into the streams and bays. In one way is unfortunate that our mills are located so near the streams and their ibutaries; otherwise, this source of wealth would have been preserved the present generation. In Bodie, where the tailings virtually saved emselves, five cyanide plants, with capacities ranging from fifty to one ndred and fifty tons per day, have been erected and are in successful eration. Besides these there are a few small ones scattered over the ate. This bulletin has been the means of causing all or a part of these rks to be erected.

*Bulletin No. 6—California Gold Mill Practices*, by Ed. B. Preston, .E.—This practical work has been in great demand, and while prossing nothing original, it elucidates the practices in the several parts the State, and has been termed by eminent mining engineers as a actical and thoroughly up-to-date publication.

*Bulletin No. 7—Mineral Statistics of California for the Year 1894*, by as. G. Yale, Statistician.—This table was issued late in the summer 1895, and proved most interesting as well as a surprise to a very large mber of people well informed of the State's productions, but who were, vertheless, unaware of some of our mineral productions and their lue. The delay in getting this bulletin to press arose from either the gligence or the reluctance of the producers to respond to our inquiries, hough we assured them that the individual productions would be so ouped that no one's private business would be revealed. In some ses as many as four or five letters of inquiry were sent, and yet some led to respond. In these cases we obtained the information from ıer sources.

*Bulletin No. 8—Mineral Productions of California for 1895*, by Chas. Yale, Statistician.—The producers throughout the State, appreciatg the importance of these statistical reports, and seeing from Bulletin o. 7 that we did not violate our promise and reveal any one's business, nerally responded promptly to our inquiries and enabled us to issue is table early in April, 1896. What is thought of our work at home d abroad may be gathered from the following extracts:

[From the Mining and Scientific Press, San Francisco, May 9, 1896.]

Bulletin No. 8 was received from the State Mining Bureau last Tuesday, and is of conerable value. Apart from its unquestionable accuracy, its timeliness is also noticee, it being months in advance of the date at which such compilations are ordinarily ilable, reflecting credit on the Bureau and all connected therewith.

[From the Mining Journal, Railway and Commercial Gazette, of London, May 30, 1896.]

*California During 1895.*—It was only in December last that we had occasion to draw ention to the mineral output of California during 1894, which reached us through the dium of the California State Mining Bureau, and which gave very forcible evidence the progress made by the industry throughout the whole of the State. In our comnt upon these statistics we complimented the Bureau upon the excellent work it was

doing, and upon its energy and promptitude in making the world acquainted with th achievements of California, and at the same time we lamented that so excellent a example was not generally imitated by other countries, of whose outputs we desire a early and complete knowledge. In publishing the figures for 1895, the Bureau h shown much greater promptitude than it displayed last year. The statistics reach us during the week as Bulletin No. 8 of the Mining Bureau, and are commendab complete. These figures, we are gratified to see, entirely bear out all that we have sa from time to time respecting the mining industry of California, and prove at a glan that it is progressing slowly, but, in all likelihood, only the more surely, etc.

We hope in time to gather the statistics of gold and silver, which a now collated by the officers of the United States Mint.

*Bulletin No. 9—Mine Drainage, Pumps, etc.*, by Hans C. Behr, Mecha ical Engineer.—It has just been issued, and is already favorab received, as it is a book of much merit, carefully edited, and ful illustrated by two hundred and six illustrations. It fills a long-exis ing void for a practical, concise, yet full, treatise on all water-raisi machinery. The high professional standing of its author will insu confidence in its statements and conclusions.

*Bulletin No. 10—A Bibliography Relating to the Geology, Palæontolog and Mineral Resources of California*, by Capt. A. W. Vogdes.—The Ca tain is in the Fifth Artillery of the United States Army, and is a mer ber of most of the Academies of Sciences in the United States, besid many foreign scientific societies. In the course of his studies, he h had occasion to refer to many works, and, perceiving the necessity of work of this kind to lighten the labors of the professional student, has prepared this pamphlet in his off hours during the past few yea That it will be appreciated by the class for whom it was intended, go without saying.

*Bulletin No. 11—The Oil-Yielding Formations of Los Angeles, San Barbara, and Ventura Counties*, by W. L. Watts.—Early in 1894 t petroleum industry of Los Angeles began to assume such an impo tance, that it was desirable to study the geological features of Southe California, and compare the geological horizons and stratigraphic features of the several oil-producing territories. About the same ti we received the following:

At the regular meeting of the Los Angeles Chamber of Commerce, held Augus 1894, the following resolution, presented by George W. Parsons, Chairman of the Co mittee on Mines and Mining, was, on motion, unanimously adopted:

WHEREAS, A great and increasing interest is being manifested in the petroleum a other mineral development of this portion of the State, and we learn that the St Mining Bureau, through one of its fieldmen, has investigated and reported upon oil- and gas-bearing formation of the Sacramento and San Joaquin valleys, thus imp ing very valuable information, to the great assistance of capitalists and investors, a consequent increase in production; and whereas, it appears very desirable that sim investigation should be made, particularly of the oil-and gas-bearing formation on t side of the Coast Range and south of the Sierra Madre range, with direct reference this locality and the immediate vicinity of Los Angeles, for the reason that large inv ments have been made upon this side of the Coast Range in the minerals referred which should certainly entitle us to due consideration; therefore, be it

*Resolved*, That this Chamber present this whole matter to the attention of the St Mineralogist at San Francisco, with a request that he take such action in the r future, including active investigations in the field, as shall constitute a proper prese tion of the whole subject, with maps, charts, and such other aids as are necessary define the mineral belts and give a clear conception of the whole subject.

In compliance with the above request, we detailed Mr. W. L. Wa to make a thorough examination of the several fields, as he had h some years' experience with the oil-bearing formations in the great val of California. He entered upon this duty October 1, 1894, and has co pleted the work for part of the field. He has been constantly emplo

this work and has devoted about nineteen months to field work alone. has been very successful in solving many of the intricate geological oblems, and it has been necessary to supply to many of those engaged the business blue-print copies of his sketch maps, in order to take ctical advantage of his researches in advance of the regular publica-n, as they need them in their business now. They have proven his rk to be valuable by following his directions, and thereby obtaining d wells in a different direction to that followed by themselves.

Deeming it eminently proper to give the public the benefit of his earches as early as possible, we authorized him to accede to the request the citizens of Los Angeles and lecture upon this subject. He lectured ce before the Chamber of Commerce and twice before the Southern lifornia Academy of Sciences, to which the public in general were ited. He illustrated his lectures with stereopticon slides of views, logical sections, etc. He did not attempt to go into the subject fully, to give only his deductions from the accumulated records. That it s appreciated is evidenced by the very full reports in the newspapers l the complimentary notices thereof, and the following:

The following is a copy of resolutions adopted by the Executive mmittee of the Academy of Sciences, May 8, 1896:

*esolved*, That the papers relating to the geology of the Southern California oil fields, l before the Southern California Academy of Sciences by Mr. W. L. Watts of the e Mining Bureau, are very highly appreciated by the Academy, not only for their ellence as scientific treatises, but also for the valuable practical information they e conveyed to those interested in that field of development in this section of the te.

*esolved*, That in view of the useful results achieved by Mr. Watts in the faithful. istaking, and original investigations made by him, we heartily recommend a continu-e of the scientific work he has so ably prosecuted in Southern California under the ction of the State Mineralogist, Hon. J. J. Crawford.

His bulletin will be read with much interest by the public generally, l will be studied closely by geologists, and particularly oil men. It is manuscript, and soon will be sent to the State Printer.

Mr. Ross E. Browne has had in contemplation for two years past the paration of a bulletin on the subject of *Water Ditches, Pipes and the w of Water Therein, Wheels, etc.*, but his professional duties, together h ill health, have prevented the fruition of his plans. The well-known lity of Mr. Browne, and his intimate acquaintance with this subject, l insure a great demand for the work when issued.

Mr. Albert Maltman, of Grass Valley, has consented to write a mono-ph on *Chlorination of Gold-Bearing Sulphurets, etc.* He is part owner nd conducts the Nevada County Reduction Works at Grass Valley, l hence, he is thoroughly familiar with a subject upon which many ire information, and which is not available in any text-books.

**Miscellaneous Papers.**—In the latter part of this volume will be nd original papers of great interest and instruction. The able article *Compressed Air*, by Arthur De Wint Foote, will direct attention to s most important means of transmitting power, and may enable the dent to compare its efficiency and economy with that of electricity.

The value of the article on *Timber Preservation*, contributed by John Isaacs, Chemist in charge of the Southern Pacific Company's (Pacific tem) timber-preserving plants, can hardly be overestimated. The t of "burnettizing," about $3 per M, is so small that statutes should

be enacted to enforce its adoption by all parties placing timber in mine. Then the most horrible of all mine disasters, fire, would practically be prevented. As timber thus treated lasts twice as long as, if no longer than, untreated timber, the economy should commend itself to mine and mill owners, to say nothing of the avoidance of danger from fire. It is also important that trestles and flumes supplying water for power, municipal, and other purposes should be so treated to avoid the danger of being destroyed by forest fires. Many other sources of employing burnettized lumber and timber will suggest themselves to practical men.

Dr. Salathè's paper will prove a valuable acquisition to the technical literature on the subject of the rapidly growing industry, petroleum. His researches are extensive and have never before been given to the public. His ability to treat such a subject is attested by his years of employment as chief chemist for the Standard Oil Company of New York, and the Union Oil Company of California, at Santa Paula.

The very excellent article by W. F. C. Hasson, Electrical Engineer, on the several electrical transmission plants in successful operation in this State, together with the numerous illustrations, will prove a valuable addition to this class of literature. It is given in a full, yet concise and practical form, that will be appreciated by business men.

In order to give the general mining public of California the latest light on subjects that are useful and essential in their business, we have copied from creditable sources the following: *The Coming Motive Power* from the "Inventive Age"; *The Sampling and Measurement of Ore Bodies in Mine Examinations*, by Edmund B. Kirby; *Comstock Ore Sampling*, by John D. McGillivray.

Other Mining Bureaus, copied in the main after our own, have been established in British Columbia, Colorado, and Washington. Mr. Carlyle, the Provincial Mineralogist, spent some days with us to learn our methods and laws, and no doubt the result of his investigations will appear when his office shall have got into good working condition. In Colorado, *mine inspection* is connected with the office, as recommended for our own in a previous paragraph herein.

**California Miners' Association.**—During the last two years the California Miners' Association has done much to advance the mining industry, and has prepared the way for much needed legislative relief.

After vainly protesting against the issuance of railroad patents covering land possibly mineral in character, the Association had a bill introduced in the present Congress at its first session, providing for the segregation of the mineral lands within the railroad land grants by commissioners to be appointed by the President for that purpose. The bill passed both Houses of Congress, and is now pending in the lower house, awaiting an agreement by the two houses upon amendments added to the bill in the Senate. It is believed the bill will become law during the short session of Congress beginning in December next.

The Association secured from the present Congress an appropriation of $250,000 for the construction of restraining barriers, in accordance with the provisions of the Act of March 1, 1893 (commonly known as the Caminetti Act). These works are to be constructed for the purpose of "restraining such material as is now, or may hereafter be, lodged in the tributaries of the Sacramento and Feather rivers, and the branches

such tributaries, resulting from mining operations, natural erosion, other causes." The report of Col. Geo. H. Mendell, 1882, and the ort of the so-called Biggs Commission, 1891, are declared to be the sis for the proposed works, which are to be constructed by the Cali- nia Debris Commission, under the direction of the Secretary of War. Other measures, introduced in Congress at the request of the Associa- n, are still pending in that body, with fair prospects of final passage, tably the one providing, among other things, for the transfer of con- ts as to the mineral or agricultural character of the land from the S. Land Offices to the local courts.

**Field Assistants.**—Every county in the State, except Modoc, has en visited by one or more of our Assistants. In 1895, Fred C. Mathyas ited, in the order named, the western parts of Siskiyou and Trinity nties, Del Norte, Humboldt, Mendocino, Lake, Napa, Sonoma, d Marin counties, and in 1896, the mountainous portions of Fresno, lare, and Kern counties, Inyo and Mono counties. In 1895, Mr. John Means traveled through Santa Clara, Santa Cruz, San Benito, nterey, the northern part of Santa Barbara and Ventura, the western valley parts of Kern, Tulare, Kings, Fresno, Madera, Merced, Stanis- us, San Joaquin, Sacramento, Placer, Yuba, and Butte counties, tter, Tehama, Glenn, Colusa, Yolo, Solano, Contra Costa, and Ala- da counties. In 1895, Mr. Edward B. Preston visited the eastern rt of Siskiyou and Trinity counties, and Tehama, Lassen, Plumas, d Sierra counties. In 1896, he visited El Dorado, Butte, Nevada, and e extreme eastern part of Placer County. In 1895, Mr. W. H. Storms ited Amador, Calaveras, Tuolumne, Mariposa, and Madera counties. 1896, he inspected Riverside, San Bernardino, and San Diego counties, d the greater part of Placer County, besides making a flying trip in gust last through what are known as the "Mother Lode" counties, to ng the data of this important section up to date. In 1895, Mr. James Tibbett visited Alpine, Mono, and Inyo counties. Besides his special ld work on petroleum, Mr. W. L. Watts visited, in 1895 and 1896, e counties of Los Angeles, Orange, Santa Barbara, and Ventura.

Before the Field Assistants began their work for the Report they were vided with kodaks, and although all of them, excepting Mr. Watts, re unacquainted with photography, their work has been very credit- le, and some of the hundreds of views taken of mines and incidental rks are utilized in this report. Mr. Watts has taken pictures that e unexcelled and are veritable works of art.

Unremitting and untiring in his zeal to advance the work of the reau, unceasing in his donations to make the mineralogical collection complete as any, and for his daily attendance and advice, the thanks the State as well as of myself are due to our honored President, r. J. Z. Davis.

To you, gentlemen, I desire to tender my heartfelt thanks for the very dial support accorded me in line with my duties. I shall forever erish most pleasant recollections of our four years' official intercourse.

Our thanks are due to the *Journal of Electricity, Mining and Scientific ess*, and the Folsom-Sacramento Electrical Power Company, for loan illustrations and other courtesies.

I am pleased to say that each and every one of the Field Assistants d office employés has displayed ability and zeal in his duties, and

to each I tender my thanks for hearty coöperation in the work of t Bureau.

The members of the mining engineering profession, and the mai friends of the Bureau throughout the State, deserve the thanks of t Trustees and Mineralogist for assistance rendered in various ways.

Respectfully submitted.

J. J. CRAWFORD,
State Mineralogist.

# ANTIMONY.

## Kern County.

*Antimony Mine.*—It is ¾ mile N. of Havilah, at 3,400′ altitude. The e (stibnite) occurs in irregular masses in a mineralized zone in the rphyry. Developments consist of a 70′ tunnel and a 60′ winze, with me drifts. G. Miller and J. B. Ferris, of Havilah, owners.

*Bousby Mines.*—See our Xth and XIIth Reports, pp. 225 and 21. ıey are on Antimony Mountain, near the head of San Emidio Cañon. le.

*Erskine Creek.*—See our XIth and XIIth Reports, pp. 237 and 21. ıere are several small mines here which have yielded stibnite and ıtive antimony. Idle.

*Grace Darling Mine.*—It is an old location near Erskine Creek. Idle.

*Padre Mine.*—See our XIIth Report, pp. 21–22. It is in Tailhold ıñon, and was located in 1892. Idle.

*San Emidio Mines.*—See our VIIIth, Xth, and XIIth Reports, pp. 0, 225, and 22. They consist of five patented and four unpatented ıims, and are in San Emidio Cañon, in the southwestern part of the unty. The ore averages 40% antimony, and occasionally carries ver, iron, and arsenical pyrites. Worked intermittently.

*Undeveloped Deposits* exist in the mountains east of San Emidio ıñon, in a granite formation for a distance of 4 miles.

## Riverside County.

*Crowell Mine.*—It is 5 miles S.W. of South Riverside, at 1,700′ eleva- ɔn. A number of superficial cuts have been made at various places on e claim, and on one of them several hundred pounds of stibnite have en taken out. The ore occurs in irregular bunches in a mass of much attered and decayed rock. The workings had caved, and a satisfac- ry examination was impossible. The ore found was of excellent ıality. J. Irving Crowell, of South Riverside, owner.

# ARGENTIFEROUS GALENA.

## Inyo County.

A number of mines, which were running when our last Report went press (1894), have ceased operations, and, until there is a revival in t silver market, it is useless to continue a record of them.

In the *Cerro Gordo District*, the *Belmont*, *Ignacio*, *Wittekin*, and mar others, formerly heavy producers, are idle. In the *Union mines* a fe chloriders work on a lease. They are jigging the old dumps. In t *Beauregard* and *New Town mines* a few men are employed to keep t timbers up; little, if any, ore is being produced. The silver mines *Panamint Range* are practically idle, only assessment work being dor In the vicinity of Darwin several mines are still working. In the ma shaft of the *Defiance group* prospect work has been done below the 4( level, and in the *Lucky Jim group* some ore is being stoped from a dr on the 600′ level.

*Landmark Mine.*—It is on the western slope of the Inyo range, 8 mil S. of Keeler. A vein, 1′ to 2′ wide, of argentiferous galena, dipping 8 W., and inclosed in limestone, is developed by three tunnels, 75′ to 1 long, and a 75′ winze in the longest one. Philip Gehrig, of Keel owner.

*Last Chance No. 2 (Sorba) Mine.*—See our XIIth Report, p. 24. is 2 miles E. of Darwin, at 4,175′ altitude. The vein courses S.W. a N.E., nearly at right angles to the strike of the extremely hard silicio limestone, in which it occurs. The main shaft is 500′ deep, and follo the vein slightly out of perpendicular to a depth of 300′, where a dri 100′ long, has been run S.W. The ore here is about 2′ thick, a consists of carbonate of lead, with an occasional nest of galena. T ore-shoot is more than 100′ long, dipping nearly vertically, and l S.W. of the main shaft. At the 300′ station a cross-vein, striking N. and S.E., and averaging 4′ in width, was encountered, and the sh follows it down for the next 200′. In that distance the vein changes course so that at the bottom of the shaft the two veins are nearly paral and about 15′ apart. Extremely rich ore has been taken from t cross-vein. Two new shafts, each about 100′ deep, have been su 300′ and 600′ S.W. of the main shaft. In the farther one another o shoot was found, and is shortly to be prospected. Wood being exp sive, a 12 H.P. petroleum gas-engine runs the hoist, and seems to g entire satisfaction. D. C. Lane, of Darwin, owner.

*Modoc Consolidated Mining Co.'s Mines.*—See our XIIth Report, p. They are on Lookout Mountain, 15 miles S.E. of Darwin. Stoping being done in the lower (No. 2) tunnel, which is 1,200′ long, and wh a large ore-body has been discovered lately. Frank Fitzgerald, Modoc, lessee.

*Montezuma Mine.*—It is on the western slope of the Inyo range miles S.E. of Big Pine. The vein is 12′ wide, and lies in a limest

rmation. Discovered some years ago by a slide from the mountains, ıen several tons of ore were reduced in a small smelter. In 1894, a 7′ in of high grade was discovered. Thos. Hill et al., of Big Pine, ⁄ners.

*Sorba Mine.*—See Last Chance No. 2.

*Star Mine.*—It is in Argus Cañon, 8 miles S. of Modoc. The vein is mass of honeycombed quartz, 2′ thick, and carries hornsilver and a tle gold. Paul Pfefferle, of Modoc, owner.

*St. John and St. Arthur Mines.*—See our XIIth Report, p. 24. A new nnel is being driven at a point 100′ below the old workings. J. J. ınn, of Modoc, owner.

## Orange County.

Although silver-bearing lead ores are found at several points in this unty, the mines are not exploited to any extent. The silver-lead ores e usually accompanied by zinc and other objectionable bases; and, ing far from railroads or other means of cheap transportation, the st of shipping or treatment is expensive. However, within the past ar, mining operations have been resumed on a small scale in the lverado and Elsinore districts.

*Acme Mine.*—See our XIIth Report, p. 25. It is 7 miles W. of Elsi- re. In the prospective stage. Budd Waller, of Perris, owner.

*Blue Light Mines.*—This group is near the head of Santiago Cañon, in lverado District, at 2,000′ elevation. The developments consist of ımerous tunnels and open excavations. A small plant has been built the foot of the mountain, and an attempt to concentrate the sulphide inerals (lead, zinc, and iron) is to be made. — Dunlap, of Los Angeles, ⁄ner.

*Old Dominion Mine.*—See our XIIth Report, p. 25. It is 7 miles E. of sinore, at 2,500′ elevation. After the failure to smelt these ores in 94, the property remained idle until the spring of 1896, when prepara- ns were made to mine and ship a quantity of ore. James Balfour et , of Elsinore, owners.

## San Bernardino County.

*Carbonate Mine.*—See our IXth, Xth, XIth, and XIIth Reports, pp. 3, 527, 361, and 26. It is at Oro Grande, and is the principal mine the district. The ore-shoots occur in limestone in large masses, ving a vein-like form. The ore is limonite, lead carbonate, and anganese oxide. It contains both silver and gold. Ore is shipped to lorado smelters. T. J. Fleming et al., of Los Angeles, owners; Robinson, of Oro Grande, superintendent.

*Cleveland Mine.*—See our IXth Report, p. 234. It is 5 miles S.W. of lico. It has considerable development, and produces a good grade of ıd-silver ore, but has been idle several years.

*Dana Mine.*—It is a new prospect, 1 mile S.E. of Cushenbury, in the e Black Hawk Mountains. It has an 80′ shaft. H. Dana, of Victor, ⁄ner.

*Duncan & Clark Mines.*—They are 6 miles N.W. of Barstow, at )00′ elevation, and are new prospects; the deepest workings being 75′. ıe ore is lead carbonate, carrying a variable amount of silver. Horn-

silver, also, is found in some of the claims, associated with malachit Duncan & Clark, of Barstow, owners.

*Galena Camp.*—It is 7 miles S.W. of Oro Grande. The claims a all in prospective stage. Not visited.

*Galena Mine.*—It is a prospect near Oro Grande.

*Galoot Mine.*—See our XIIth Report, p. 26. It is a prospect in Or Grande District. Idle. — Jones, of Oro Grande, owner.

*Harrison Mine.*—See our IXth and XIIth Reports, pp. 235 and 26. is a prospect, 5 miles N.E. of Oro Grande. The ores are galena and zinc blende, carrying gold and silver. Idle.

*Lookout Mine.*—It is a prospect near Oro Grande. Idle.

*North Camp.*—It is 7 miles N.W. of Oro Grande. All the claims i the camp are idle. Not visited.

*Northern Cross Mine.*—It is ½ mile E. of Oro Grande. It has a 9 shaft, and some superficial work, but little ore. Estate of H. Easto of Oro Grande, owner.

*Oro Grande District.*—See our Xth, XIth, and XIIth Reports, pp. 52 361, and 26; also under head of "Gold" and "Silver." The only lead silver mine in operation in this district is the Carbonate.

*Santa Fe Mine.*—It is a prospect in Oro Grande District.

*Silver Mountain District.*—See Oro Grande District.

*West Camp.*—It is 12 miles W. of Oro Grande. All the claims a idle. Not visited.

## Siskiyou County.

A vein of quartz containing galena crosses the ridge between Fox an Boulder creeks, 4 miles W. of Callahan. Several open cuts and sho tunnels were made on it. Now abandoned.

# ASPHALTUM AND BITUMINOUS ROCK.

## Kern County.

*Buena Vista Oil and Asphaltum District.*—See our XIIth Report and lletin No. 3, pp. 26 and 41. The principal asphaltum-bearing formations in the foothills of the Coast Range, on the western side of the n Joaquin Valley, and the localities known as the *Buena Vista* and *Sunset Oil Districts.*

*Buena Vista Oil Co.*—See our XIIth Report and Bulletin No. 3, pp. and 41. The asphaltum and petroleum claims of this company are the Buena Vista District, and are fully described in the above reports. e.

*Jewett & Blodget Claims.*—See our Bulletin No. 3, p. 27. They are in Sunset District. Since our last Report four shafts have been sunk Sec. 13, T. 11 N., R. 24 W., 96′ to 110′ deep, connected by drifts, and ve as reservoirs for the seepage of liquid asphaltum, which is said be well suited for coating and insulating mixtures. Fifty barrels said to be produced daily at present, and can be increased by further elopment. Messrs. Jewett & Blodget, of Bakersfield, owners.

*North Buena Vista Oil Co.*—The property of this company is 3 miles W. of Asphalto, in Sec. 13, T. 30 S., R. 21 E.; three shafts, 14′ to 40′ p, serve as reservoirs for the tar-like petroleum which collects in m. One well, 8″ in diameter and 325′ deep, is said to flow 1 bbl. of per day. The strata penetrated dip N.E., and are as follows:

| | |
|---|---|
| Debris | 8′ |
| Black shale | 7′ |
| Sandy clay and gravel | 23′ |
| Black shale | 4′ |
| Bituminous sandstone | 33′ |
| White shale (a little oil) | 7′ |
| Sandy clay and gravel | 12′ |
| Brown shale and thin sandstone | 86′ |
| Flinty white oil-bearing shale | 17′ |
| Brown shale | 38′ |
| Soft white shale | 20′ |
| And black and brown shale to the bottom. | |

econd well is being drilled. A. Devoto, of San Francisco, secre- y; J. W. Briggs, of Bakersfield, superintendent.

*Standard Asphaltum Co.'s Mine.*—See our XIIth Report and Bulletin 3, pp. 28 and 41. It is in the Buena Vista District, being the S.W. f Sec. 27, T. 30 S., R. 22 E., and is 1½ miles S.E. of Asphalto, at ut 1,200′ altitude. A great amount of indiscriminate prospecting has n done on this property, but recently more systematic development carried on. Two shafts, 280′ and 310′ deep, have been sunk on a n-like deposit, which dips 60° to 70° N.E. They are 400′ apart, ow the dip of the vein, and drifts are being run to connect them. A se-whim at each shaft is used for hoisting, and a gasoline-engine for ing air into the mine. The high-grade asphaltum in the main vein is

from 6″ to 5′ thick, and grades into brown bituminous rock. It fi joints in the country rocks and spaces between the bedding planes. general, the so-called vein conforms to the bedding of the rocks, whi are soft sandstone, but the foot-wall is greatly broken by compressio and in places dips away from the vein. The asphaltum from this ve is said to run 85% to 90% pure, and is largely marketable without refi ing. The surface is covered with soil and disintegrations to such depth that the vein-like deposits cannot be traced on the surface. T refinery is situated at Asphalto, the terminus of the railroad, and furnished with 21 kettles, of which 6 are now in use; the daily capaci per kettle is about $1\frac{2}{3}$ tons. The crude asphaltum is heated in t kettles; the volatile oils driven off; the impurities—clay, sand, etc. settle, and the mass is tempered by adding crude petroleum. T former crude methods of testing its consistency by pulling or chewi it, have been replaced by determining its melting temperature. Twent six men are employed. C. E. Hayes, of San Francisco, secretary; W Bell, of Asphalto, superintendent.

*Sunset District.*—See our XIIth Report and Bulletin No. 3, pp. and 26. Idle.

## Marin County.

Seams of asphaltum are visible in the clay-shale cliffs at Bolin Bay.

## Mendocino County.

Extensive beds of bituminous rock exist at Point Arena, which co tain from 6.8% to 11.2% volatile matter. Fully described in our VII Report, pp. 200–202. Idle.

## Monterey County.

The industries of this county are principally agriculture. The lan in the valleys are generally cultivated; the hills and mountain slo are used for pasture. Bored wells are numerous in the principal v leys; and in the lowlands west of Castroville, etc., they are in p artesian. Water for irrigation may be diverted from Arroyo Seco a other mountain streams. The mineral resources which have been may become of economic importance are bituminous rock, coal, go limestone, sandstone, mineral waters, etc.

*Mylar Mine.*—See our XIth Report, p. 259. It is in the foothills the south side of San Lorenzo River, 11 miles E. of King City, at abo 800′ altitude. The deposit is in irregular bunches about 600′ wide, thick, and a total length of about $\frac{1}{4}$ mile. It occupies the channel of old stream, and waterworn bowlders underlie the bituminous rock. overlies porous sandstone and shales near their contact with granitic rocks on the east. The sand in the bituminous rock is genera coarse-grained. From 1′ to 3′ of hard crust is formed on the surfa below which the rock is softer. Three men are employed. The My Asphalt Co., owner; Thomas Mylar, of Lonoak, manager.

*San Antonio River Deposit.*—See our VIIth and XIIth Reports, 85 and 29. It is in Sec. 35, T. 24 S., R. 10 E., 7 miles S.W. fr Bradley station, and is undeveloped.

## San Luis Obispo County.

ituminous rock of various grades occurs in a belt in many places in southwestern part of the county near the coast. It occurs both as tified layers, and in segregated bunches. It consists essentially of d disseminated through stiff, heavy bitumen, which forms a compact s. Iron, lime, magnesia, etc., are also present in various quantities. t containing about 14% to 17% bitumen is suitable for all sorts of ements, while the poorer grades (brea) may be used for fuel, etc.

*eckett Mine.*—It is on the point of a hill about 100′ above the town rroyo Grande. The bituminous rock is from 2′ to 4′ thick, and is rlaid by a heavy bed of gravel and soft sandstone. It was worked a years ago by a cut 125′ long, 12′ wide, and 15′ deep at its face. . Beckett, of Arroyo Grande, owner.

*ordan Mine.*—See our XIIth Report, p. 29. It is on the Corral de dra grant, 7 miles S.E. of San Luis Obispo, at about 250′ elevation. bituminous rock occurs in a large bunch in the soft sandstone, and verlaid by 2′ to 10′ of sandy clay. Its depth is unknown. It is ked in an irregular, open cut, about 100′ in diameter and 50′ deep. rock is hauled to Pismo and shipped in vessels. Fourteen men are loyed. Jordan Bituminous Rock and Paving Co., of San Francisco, ier; E. A. Crossman, superintendent.

*regon Co.'s (California Bituminous Rock Co.'s) Mine.*—See our VIIth, , and XIIth Reports, pp. 98, 574, and 30. It is about 7½ miles S. of Luis Obispo, and is idle. Oregon Bituminous Rock Co., of Port- d, Or., owner.

*an Luis Obispo Bituminous Rock Co.'s Mine.*—See our VIIth, Xth, XIIth Reports, pp. 97, 572, and 30. It is on the P. C. R. R., 7 miles from San Luis Obispo, at about 200′ altitude. The company s 1,100 acres of land, on which a vast quantity of bituminous rock irs, and outcrops in many places. There are seven open cuts from ch it has been mined; one, known as "Black Rock, No. 3," is work- and six are idle. It is at the base of a low hill, on the east side of railroad, with which it is connected by a spur ¼ of a mile long. s cut is 240′ long, 60′ wide, and 40′ deep at the face. The bitumi- s rock is 30′ or more thick, of uncertain extent, and passes under a sandstone, dipping 15° S.W. The rock is broken up, carefully rted, sacked, and shipped by rail. The company has on the prop- a "bituminous rock disintegrator" of 80 tons daily capacity. The passes through a crusher, thence into a horizontal cylinder 18′ and 38″ inside diameter; in it the rock is warmed by steam, which es around the cylinder and through the central revolving shaft and ow arms arranged on it, and thoroughly mixed, made uniform in acter, and greatly reduced in bulk. The reduction in freight and r expenses of handling more than equals that of disintegration. machine is driven by an engine, and the poor bituminous rock a) used for fuel. Ten men are ordinarily employed. It is tempo- y idle. W. G. Hughes, Phelan Building, San Francisco, secretary; es Cormack, of Edna, superintendent.

*r Springs Asphalt Mine.*—See our XIIth Report, p. 30. It is 9 s E. of Arroyo Grande, at about 600′ altitude. It occurs as super-

ficial deposits from springs. The following analysis is by chemist C. Ogden, of San Francisco:

| | |
|---|---|
| Sand | 6.83% |
| Clay | 3.36 |
| Lime | 2.81 |
| Asphaltum | 87.00 |
| Total | 100.00 |

Idle. Tar Springs Asphalt Co., of Los Angeles, owner; L. W. Johns of Los Angeles, superintendent.

## Santa Barbara County.

During the last two years, work has been actively prosecuted at t La Patera Mine, at the deposits of bituminous sand at Carpinter and at the Alcatraz refinery. Extensive deposits of asphaltum ha also been uncovered at the Sisquoc, Waldorf, and Kaiser mines, in t northern part of the county.

*Alcatraz Refinery.*—See Las Conchas.

*Harris Mine.*—See Pacific Asphalt Co., and our XIIth Report, p.

*Kaiser Mine.*—It is situated 3 miles E. of Graciosa, and compri about 200 acres. It is developed by a number of open cuts and ei tunnels, from 100′ to 200′ in length. This body of asphalt is said to from 2′ to 20′ in thickness. Consolidated Asphalt Co., owner; G. Hannaman, of No. 207 S. Broadway, Los Angeles, secretary.

*Las Conchas Mine.*—It and the Alcatraz refinery are situated on seashore at Carpinteria. The mine consists of a body of bitumini sand, or sand soaked with maltha, and embraces an area of about acres, estimated to be 25′ or more in average thickness. The malth evidently derived from the bituminous shale on which the sand re The prevailing dip of these shales is N. 20° W., and the angle of incli tion is for the most part 70° or more. The bituminous sand appear lie horizontally, or to dip to the N.W. at a very slight angle. process of mining is as follows: The surface, consisting of 6′ or 8 loam, is removed by hydraulicking into the ocean; a thin stratum yellow clay which overlies the bituminous sand is then stripped and the sand is excavated with hot spades, loaded into trucks, which hauled by a cable up an inclined plane to the upper floor of the refin where it is dumped into a mixer, consisting of a steam-jacketed cylin in which revolving arms break the lumps. From the mixer the s falls into vats of boiling water—the maltha floats, and the sand si to the bottom, where revolving "worms" carry the sand to a hop feeding a "bucket conveyer," which carries the sand through a flum the point of discharge, where each bucket is played on by a jet of w to free it from the sand. The maltha, called crude flux, flows from surface of the water through a flume to a tank, whence it is pumped a storage tank at a higher elevation. From the storage tank "crude flux" runs by gravity into two refining kettles of 15 tons capa each, where it is subjected to a temperature, commencing at 100° F. finishing at 240° F., for about twenty hours. In this process the aqu vapor is driven off. The "refined flux" is carried by steam-jack pipes to the mixing department, where it is used as a flux for trea asphaltum from the La Patera Mine. This treatment consists of ad

e refined flux to the crude asphaltum, and revolving the mass in drums 5 tons capacity, and at a temperature of about 350° F. The amount flux added depends on the degree of hardness required in the refined phaltum. In about five hours the charge is run into a settling-kettle, ierein the impurities settle, and are removed from the bottom by a rm, and used as fuel. The refined asphaltum is conducted by a am-jacketed pipe to the "barreling tank," from which it is drawn into raveling kettle, running on an overhead gear, and discharging the phaltum into barrels. During all these processes the asphaltum is pt in a state of fluidity to admit of its being handled with celerity. e process of separating the maltha from the sand and refining the rude flux" is continuous; the manufacture of the refined asphaltum intermittent. The capacity of these works is 75 tons in twenty-four urs. About 30 men are employed in the Las Conchas mines and 30 the refinery. The Alcatraz Asphalt Co., of San Francisco, owner; F. L. Bell, of Carpinteria, resident manager.

*La Patera Mine.*—See our XIIth Report, p. 30. It is on the Den ranch, the coast, 10 miles W. of Santa Barbara. It is worked by four shafts, , 70′, 150′, and 200′ deep, respectively, and a 100′ tunnel. The phaltum occurs in bunches in a vein-like deposit, 2′ to 12′ thick, and it from the low levels becomes very porous. The mine is provided th steam hoisting works and pumps. Twenty-three men are employed. catraz Asphalt Co., of San Francisco, owner; A. F. L. Bell, of Carpinia, superintendent.

*Moore's Mine.*—It is on the coast at Moore's Landing, 7 miles W. of nta Barbara. Asphaltum occurs in bunches of 50 to 1,500 tons each, a 75′ bank of sandy clay, and also projects above the water in places ar the beach. The bunches are disclosed by the bank caving away, rtly caused by the asphaltum expanding as the pressure is relieved; ns and "stringers" of asphaltum extend from them to uncertain ths. Five men are employed. J. F. Moore, of Santa Barbara, ner; David Culver, of Goleta, superintendent.

*Pacific Asphalt Co.'s Mines.*—They are 13 miles S.E. of Santa Maria, about 600′ altitude. The asphalt occurs in irregular masses and vein-e bunches in soft, sandy clay, and is said to be 50% to 60% pure. e impurities in the crude materials consist principally of sand and ndy clay. The company works the *Harris* mines and six cuts on the *wland ranch*, the adjoining property. A refinery, erected in 1894, has ut 15 tons daily capacity. The rock passes from the crusher into two lting-tanks, where about 30 gals. of crude petroleum per ton is added l melted by superheated steam in the jackets around the tanks. It n passes into a settling-tank of 20 tons capacity; after the sand, etc., tle to the bottom, the asphaltum is drawn into a tempering-tank, ere the process is completed. The sediment from the settling-tank is d for fuel in the refinery. The refined asphaltum is shipped in bar-s. There are 30 to 35 men employed in mining, refining, coopering, ming, etc. A. N. Millspaugh, of Santa Maria, superintendent.

*San Carlos de Jonate Ranch.*—See our XIIth Report, p. 32.

*Santa Maria Asphalt Co.'s Mines.*—See our XIIth Report, p. 32. They 10 miles S.E. of Santa Maria, at 600′ to 700′ altitude. Asphaltum l bituminous rock outcrop over a large area. The developments consist numerous open cuts and tunnels, 10′ to 115′ long, in which a vast ntity of asphaltum is exposed, in vein-like bunches and disconnected

masses, varying from low to high grade. The country rock is soft san stone and sandy clay. Three men are employed in developing. Kaiser, of Santa Maria, manager.

*Sisquoc Grant.*—It is 8 miles N. of Los Alamos, and embraces 35,48 acres. On it are two of the largest known deposits of asphalt in t world. (See map and cross-sections.) The deposit, designated as t *Brea*, is 10,560′ in length, of 500′ average width, and of 300′ avera depth. If 20 cu. ft. constitute a ton, there are 79,200,000 tons of cru material in this deposit. The *Mesa* deposit lies on a plateau 300′ abo the valleys which surround it on three sides, and at 1,900′ elevatic It is entirely exposed, except the back portion, which is covered with light soil from a few inches to several feet in depth. It is about 5,0 in length, of 800′ average width, and of 100′ average depth, and co tains, approximately, 22,222,200 tons of crude material. On account its elevation it can all be handled by gravitation at a small expen This deposit, like the Las Conchas deposit at Carpinteria, owned by t same company, is a mixture of asphalt with pure quartz sand contai ing no dirt or organic matter non-bituminous, so that the process purification is simple and perfect.

The following analysis indicates the character of the product:

San Francisco, November 15, 189

*Analysis of two Samples of Bitumen from Sisquoc Mesa Deposit.*

| | Crust Ore from Surface. | Ore from Sha taken from 20′, 40′, and Below Surfa |
|---|---|---|
| Petrolene | 77.46% | 80.74% |
| Asphaltene | 22.54 | 19.26 |
| | 100.00% | 100.00% |

Referring to the above, material such as this will, in every respect, constitute a fi class material for paving purposes. The bitumen we have found to be firm, cohes and elastic.

(Signed:) THOS. PRICE & SO

The company is now erecting at the Mesa deposit a large refini works with a capacity of 3,000 tons refined product per month. Thi men are employed. Alcatraz Asphalt Co., owner; W. N. Cowles, of S Francisco, president; A. F. L. Bell, of Carpinteria, manager.

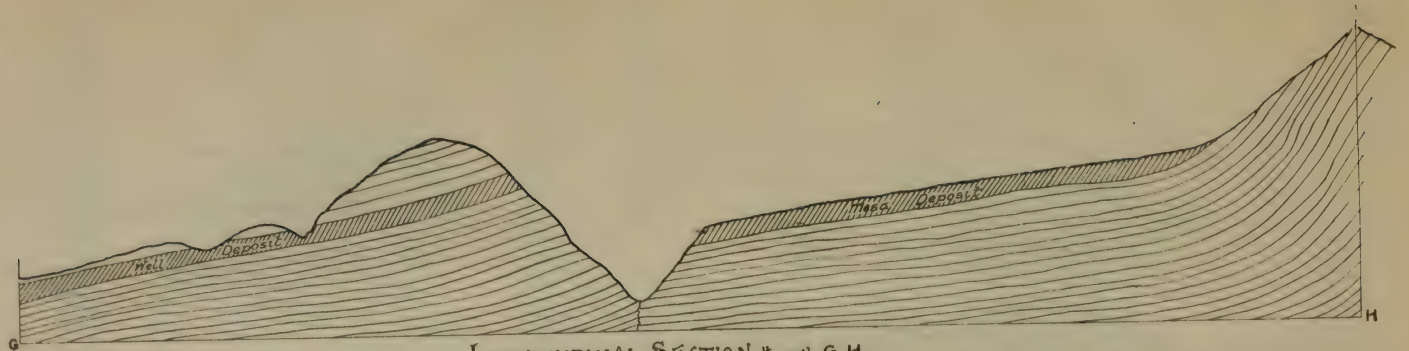
*Waldorf Asphalt Mine.*—It is 1¼ miles from Waldorf, and compri 1,153 acres in the southwestern portion of the Guadalupe ranch. T developments consist of a 274′ tunnel, from the end of which are dr 205′ W. and 60′ E. along the vein. The ledge of asphaltum is said vary from 1′ to 8′ in thickness.

*Analysis of Asphaltum from the Waldorf Mine.*

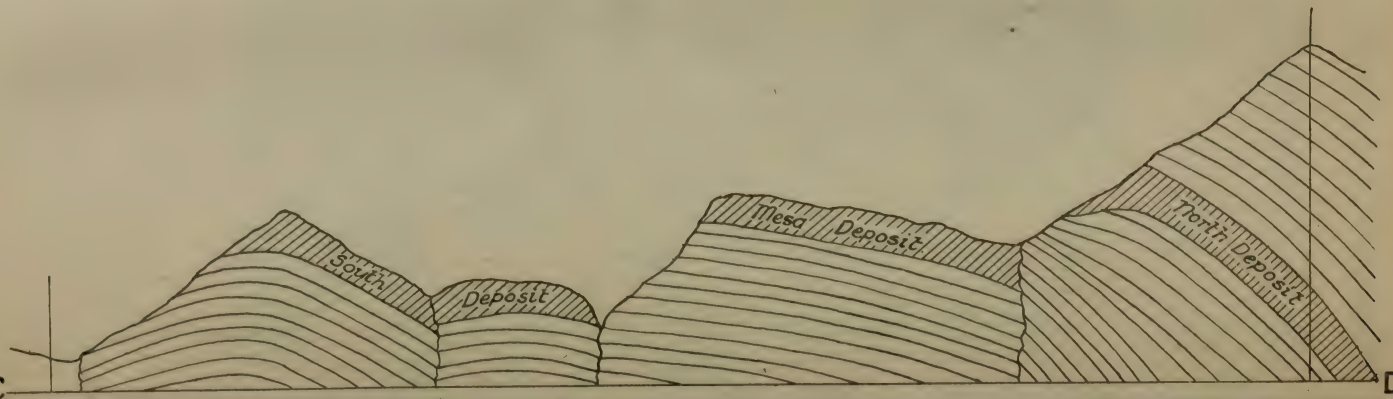
By Dr. F. Salathè.

| | |
|---|---|
| Total bitumen soluble in chloroform | 76.2% |
| Moisture | 1.8 |
| Mineral residue (infusorial earth) | 22.0 |
| Organic matter, insoluble | Traces. |
| | 100.0 |

PART
OF
SISQUOC RANCHO
Showing
BITUMINOUS DEPOSITS & OIL SANDS
SCALE
1 0 1 2 0 3 0 1 40 CHAINS
NORTH DEPOSIT
MESA DEPOSIT
Shaft
SOUTH DEPOSIT
Canada
Canada
Canada




LONGITUDINAL SECTION through G.H.



| In the extracted bitumen there is: | |
|---|---|
| Retinoid (petrolene) | 64.15% |
| Retene (asphaltene) | 35.85 |
| | 100.00 |
| **There is also in the extracted bitumen:** | |
| Free sulphur | None. |
| Combined sulphur | 0.60% |

ht men are employed. Consolidated Asphalt Co., owner; G. B. Hannan, of 207 S. Broadway, Los Angeles, secretary.

## Santa Clara County.

*Sargent's, J., Tar Springs.*—Fully described in our VIIth, VIIIth, Xth Reports, pp. 93, 548, and 607. Asphaltum and brea occur on gent's ranch, near Sargent's station, about 6 miles S. of Gilroy. It superficial deposit from petroleum springs, and said to cover about acres. Idle, and said to be "dead rented."

## Santa Cruz County.

The vast deposits of bituminous rock lie in the foothills facing the st, west and a little north of the City of Santa Cruz. They occur, the most part, in almost horizontal massive strata, which crop out steep slopes of hills, covered here and there by light-colored shales the debris resulting from their disintegration. They have been ensively eroded, and now lie in large irregular fragments, distributed r a large area. Masses of bituminous rock in vein-like deposits also st in places. The rock is as irregular in character as it is in distribution, we may safely predict, from the present developments, that the comrcially valuable bituminous rock will not be exhausted for many rs. The methods of mining by all companies is essentially the same.

*Baldwin Mine.*—See our XIIth Report, p. 28. It is in the head of a row cañon on the Baldwin ranch, 5 miles N.W. from Santa Cruz 2 miles from the coast, at 500′ elevation. The 10′ stratum of uminous rock exposed is overlaid by a heavy bed of light-colored les. A good road has been made from the mine to the county road the coast. Idle. L. K. Baldwin, of Santa Cruz, owner.

*City Street Improvement Co.'s (Waldrath) Mines.*—See our XIIth Rept, p. 29. This company owns a group of four mines, known as Nos. 3, and 4, which are about 12 miles N.W. of Santa Cruz and 3 es from the coast, at 850′ elevation. Three of them are being ked and one is idle. The open cuts are in outjutting points of a . No. 1 is more than 300′ long, with a face 110′ high, which shows following section:

| | |
|---|---|
| Light-colored shales | 60′ |
| Massive bituminous rock | 30′ |
| Very soft sandstone | 8′ |
| Massive bituminous rock | 12′ |

nderlaid by soft sandstone and shales.

The lower stratum of bituminous rock contains coarser sand than the er one, in which the sand becomes finer as the top is approached. 2 is immediately E. of No. 1, and at about the same altitude. In it stratum of bituminous rock is the same as the upper stratum of No. he cut is 150′ long, and the stratum of bituminous rock is about 14′ ck, overlaid by 25′ of shale. No. 3 is S. of No. 2, and the stratum of

bituminous rock is about 15′ thick, and is overlaid by 15′ to 20′ shale; the cut is about 300′ long. No. 4 is immediately N. of No. 2, about 900′ altitude; the cut is about 75′ long, and shows a stratum bituminous rock about 30′ thick, which is overlaid by about 15′ shales. The bituminous rock in mines Nos. 1, 2, and 3 is general "soft," while that in No. 4 is harder. The rock is mined by first stri ping off the shales, then boring a series of holes 10′ to 20′ deep alo the face; after "springing" them with a high explosive, they are charg with black powder and fired simultaneously by electricity. It is r unusual to throw down 500 tons at a single blast. The rock is th broken up into suitable sizes for handling, carefully assorted, and haul to Santa Cruz for shipment. There were employed 15 men in mini and 45 in teaming. W. E. Dennison, Secretary, Mills Building, S Francisco; Williamson & Garrett Co., of Santa Cruz, manager.

*Consolidated Bituminous Rock Co.'s (Thurber) Mine.*—See our XII Report, p. 29. It is N. of and adjoining the property of the City Str Improvement Co., at 950′ altitude. It is worked by two large cu about 200′x 300′. The stratum of bituminous rock is 10′ to 30′ thi and overlaid by shales. The rock is generally harder than that of t other mines in the vicinity, and occupies a higher stratigraphic positi It is not of uniform hardness, however, as both hard and soft variet occur. Worked irregularly, depending on the demand. F. C. Lew secretary, Phelan Building, San Francisco; Williamson & Garrett C of Santa Cruz, manager.

*Cowell Mine.*—See our Xth and XIIth Reports, pp. 621 and 28. It about 12 miles from Santa Cruz and ½ mile E. of the City Impro ment Co.'s mines, at about 800′ elevation. There are two cuts in t steep slope of a hill, which are about 200′ and 300′ long, respective and have a face 30′ to 50′ high. The bituminous rock stratum is 12′ 20′ thick, and is overlaid by a heavy bed of light sandy shale, wh caves into the cuts and causes considerable "dead work." This depo is extensive, but is only developed to a limited extent. The mine w idle during the greater part of 1895, but work was resumed in the lat part of that year. The rock is generally rich in bitumen, and the sa which it contains is largely white quartz. Fragments of shells a bones are of rather common occurrence. There are 12 men emplo in mining and 13 in teaming. Henry Cowell Lime Co., of San Fr cisco, owner; E. V. Cowell, of Santa Cruz, superintendent.

*Enright Mine.*—See our XIIth Report, p. 29. It is 9 miles W Santa Cruz, and 1 mile from the coast, at 450′ altitude. It is wor by an irregular open cut, about 100′x 200′ and 25′ deep. The bitu nous rock is rather hard, about 15′ thick, and is overlaid by about 10 shale. Idle. J. D. Enright, of Santa Cruz, owner.

## Ventura County.

*Brea Cañon Mine.*—It is in the Cañada del Laga, and about 5 miles of Ventura. The developments consist of a 50′ tunnel, partly ca and a 50′ incline. At the mouth of the tunnel a vein of smooth bl asphaltum shows a thickness of about 2′, and is said to contain ab 40% asphaltum. The vein dips about 42° S.E. The wall rock is to clay, containing fossils. W. R. W. Weldon, of Ventura, owner.

*Cañon del Diablo Mine.*—See our Xth Report, p. 763. It is abou miles N.W. of Ventura. Ventura Asphaltum Co., of Ventura, owne

Bituminous Rock Quarry of City Street Improvement Company.

*Ojai Mine.*—It is about 17 miles E. of Ventura and 3 miles E. of ordhoff. It is said that the formation is light-colored shale and that e asphaltum is a very heavy, viscous bitumen. Ojai Asphalt Co., ner; J. S. Briggs, of Ventura, manager.

*Punta Gorda Mine.*—See our XIIth Report, p. 33. It is about a mile of Rincon Creek and less than ¼ mile N. of the S. P. R. R., at about 0′ altitude. The workings consist of a 140′ tunnel and a 100′ shaft. ıe tunnel cuts through a vein of asphaltum which strikes S. 20° W., d dips 75° S.E. The vein in the tunnel varies from 10″ to 2′ in width. ıe wall rock is bituminous shale. At the mouth of the tunnel the ale is much disturbed, and in the tunnel it shows a dip of S. 30° W., an angle of about 70°. The prevailing dip of the formation north the tunnel is N. 10° E., and at an angle of about 80°. The shaft has en sunk on the vein, which is 13′ in maximum thickness. The phaltum is a uniformly black mass, which exhibits a slightly granu- structure. The following analyses are from the records of the mpany:

*Asphalt from the 40′ level;* by Geo. E. Colby, Professor of Chemistry, University of ifornia, Berkeley:

| | |
|---|---|
| Loss at 212° F. | 0.83% |
| Hydro carbon | 18.06 |
| Fixed carbon | 10.44 |
| Fixed carbon in asphaltum | 36.66 |
| Total asphaltum | 28.06 |
| Ash | 70.67 |

*Asphalt from the 60′ level ;* by C. A. Ogden, chemist:

San Francisco, Cal., November 27, 1893.

The sample of bituminous rock contained:

| | |
|---|---|
| Bitumen | 28.53% |
| Silica | 51.64 |
| Clay | 4.76 |
| Sulphate of lime | 2.45 |
| Carbonate of lime | 11.96 |
| Carbonate of magnesia | 0.55 |
| Not determined | 0.11 |
| Total | 100.00 |

The pure bitumen showed the following condition when treated at various temperatures:

| | | |
|---|---|---|
| Loss of oils at 212° F. | 2.65% | |
| Loss of oils at 212° to 480° F. | 6.95 | |
| | | 9.60% |
| Loss of oils above 480° F. | 40.72% | |
| Carbon | 49.68 | |
| | | 90.40 |
| Total | | 100.00 |

ınta Gorda Asphalt Mining and Paving Co., of Santa Barbara, owner.

*Rincon Mine.*—See our XIIth Report, p. 33. It is situated on the ncon ranch, about 1½ miles N.E. of the Punta Gorda Mine, and at out 900′ altitude. At this point the soft Pliocene sandstones rest nconformably on the bleached shales. The workings consist of a nnel and an open cut. The tunnel has been run N. 80° E., and cut rough a body of sand about 4′ thick, which is impregnated with heavy . The walls of the tunnel are soft sandstone, containing fossils. out 50′ S.E. from the mouth of the tunnel there is an open cut out 10′ deep, which shows a body of impure asphaltum, and appears be an extension of the body of oil-soaked sand and asphaltic material t in the tunnel.

# BORAX.

## Inyo County.

*Conn & Trudo Borax Works.*—They lie in Salinas Valley, 18 miles of Keeler. The firm controls about 700 acres, part of which is cover with a crust of crystallized tincal from 6″ to 2′ thick, which contai 90% borax. The crude material is dissolved in boiling water and drav off in tanks, where the impurities settle and the borax crystallizes ou Conn & Trudo, of Big Pine, owners.

*Salt Wells Borax Works.*—See our XIIth Report, p. 34. They are Salt Wells Valley, 60 miles S. of Keeler, and lie both in Kern and S Bernardino counties. The property consists of 2,000 acres of land in body. About 100 acres are covered with a crust, 3″ to 10″ thick, sulphate of soda. The rest contains "cotton balls," or *ulexite*. A analysis of the borax made by Prof. Price gives the following:

| | |
|---|---|
| Insoluble | 1.40% |
| Water | 44.80 |
| Sodium chloride | 16.28 |
| Boracic acid | 36.83 |

It contains 0.4% of "prismatic borax." Judge A. V. Davidson et a of Independence, owners.

## Lake County.

It is found at Borax Lake. See our Xth Report, p. 237. The bor existing in the bed of the lake was exhausted, and the large wor erected to extract borax from the mud of the lake proved a failure.

## San Bernardino County.

The borax industry in this county is not conducted on as vigorous scale as formerly. The large production of colemanite from the min in East Calico has apparently lowered the market price of borax, a resulted in closing the works on the dry lakes in the northeast corner the county. Only assessment work has been done on claims near Cali not owned by the Pacific Coast Borax Co.

*Pacific Coast Borax Co.'s Mines.*—See our IXth, XIth, and XIIth R ports, pp. 225, 345, and 35. They are 5 miles E. of Calico, at 3,000′ elev tion. These vein-like deposits are of considerable extent, and appe to consist of two separate veins 40′ apart. They have been opened numerous points for a distance of nearly 5 miles in an E. and W. dir tion. The sedimentary beds in which the deposits are found are fold and faulted, and also intruded by dikes of liparite and hornblen andesite breccias. Several new prospecting shafts are being sunk wi windlass, gasoline-engine, and horse-whim. These deposits have be

ined continuously for a period of ten years, and the deepest workings e now 500′ from the surface. The calcium borate is hauled in wagons miles to Daggett, and from there shipped by rail to the company's rks in Alameda. Pacific Coast Borax Co., owner; J. W. S. Perry, of ggett, superintendent.

*Stevens & Greer Mines.*—See our XIIth Report, p. 35. They are uated along the southeastern side of the Calico range, 5 miles E. from e village of Calico. The numerous claims have only superficial velopment, and are idle. They are located, not on colemanite posits, but on upturned strata of indurated mud containing calcium finely disseminated crystals. Stevens & Greer, of Calico, owners.

*The Owens Mines.*—See our XIIth Report, p. 35. They are 5 miles W. of Daggett and 6 miles S.W. of Calico. Geologically they are nilar to the Stevens Mine, near Calico, viz.: an uplift of argillaceous rata impregnated with calcium borate. Judge A. J. Owens, of Dagtt, owner.

# CHROMIC IRON.

## Alameda County.

The important industries of this county consist of fruit-growing, stock-raising, agriculture, and miscellaneous mineral industries. Macadam is produced in the foothills near Oakland and Haywards; manganese in the southwestern part of the county. The potteries and salt industry near the bay are important sources of revenue. The chromic iron mines about Cedar Mountain, and the sandstone quarries near Niles, are temporarily idle. The county possesses superior shipping facilities, both by water and by rail.

Since our last report the chromic iron claims have all been idle, on account of the low price of the material mined and the distance from market.

*Douglas Mine.*—See our XIIth Report, p. 36. It is on Cedar Mountain, 12 miles S.E. of Livermore. Idle. D. M. Mendenhall, of Livermore, owner.

*Mendenhall Mine.*—See our XIIth Report, p. 36. It is on the S.W. side of Cedar Mountain, 13 miles S.E. of Livermore. Considerable good ore is said to have been obtained from it. Idle. A. Mendenhall, of Livermore, owner.

## Calaveras County.

Chromic iron occurs 10 miles N.E. of Milton, on the ranch of Capt. John Wright, in Salt Spring Valley, in the serpentine belt which skirts the western base of Bear Mountains. A similar deposit is found on the Tower ranch, near the Angels stage road, 9 miles E. of Milton. Very little work has been done on either of these deposits.

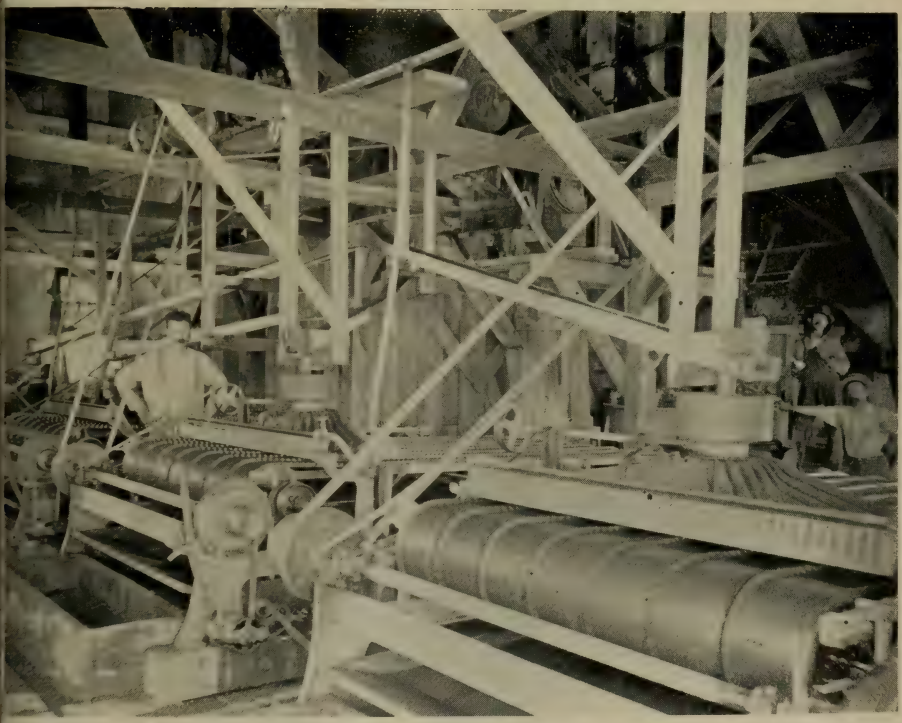
## Del Norte County.

Large deposits of chromite are found in the Rattlesnake Mountains, from Bald Hill to the Klamath River, imbedded in the serpentine country rock. They are not located, as the cost of transportation is too great to make their working profitable at present.

*French Hill (Tyson) Mines.*—See our Xth and XIIth Reports, pp. 167 and 36. They lie at French Hill, 3 miles S. of Gasquet, in Sections 5 and 6, T. 16 N., R. 1 E., H. B. M., at 1,750′ to 2,000′ altitude. The company owns some 900 acres of land, on which chromite is found as kidneys imbedded in serpentine. The large deposits have been cut and wagon roads built to them. Idle. Tyson Mining Co., of Baltimore, Md., owner.

*Low Divide (Tyson) Mine.*—See our Xth and XIIth Reports, pp. 167 and 36. This property lies on Low Divide Mountain, 8 miles E. of Smith River P. O., at 2,460′ altitude. A large body of ore is exposed by several open cuts. Idle. Tyson Mining Co., of Baltimore, Md., owner.

San Luis Chrome Works—Exterior View.



San Luis Chrome Works—Interior View.

## Fresno County.

Chromite occurs in the serpentine belt, 6 miles S.W. of Toll House.

## Mendocino County.

Chromite of good quality is found in several places in the hills west f Russian River Valley. The individual deposits are not large, but here are quite a number of them. Efforts are being made to develop he mines.

## Napa County.

Deposits of chromite occur in the range east of Napa, in Pope and Chiles valleys, and near St. Helena.

## San Luis Obispo County.

Chromite occurs in many places in the Santa Lucia Mountains in the northwestern part of the county, principally in small bunches, seams, etc., penetrating zones of serpentine; a large part of the ore produced has been taken from superficial debris. Numerous claims have been taken up, and worked intermittently, but the ore is too low-grade or scattered o be systematically and profitably worked at present prices, viz., about $8 per ton. The following claims have produced to date about 17,860 ons, and are fully described in our VIIIth, Xth, and XIIth Reports, pp. 351, 582, and 37:

| | | | |
|---|---|---|---|
| Arroyo de la Rodilla. | Jasper. | Lone Pine. | Primera. |
| Castro. | Kaolin. | London. | Rodilla. |
| El Devisadero. | La Trinidad. | Mono. | San Carpojoro. |
| El Salto. | La Flor. | New Magdalen. | San Theresa. |
| Estrella. | Las Amigus. | Old Magdalen. | Soledad. |
| Guadalupe. | Little Salto. | Pick and Shovel. | |

There are no new developments.

*The San Luis Chrome Company* has concentrating works, and purchases such ore as is offered, which it concentrates and ships to Baltimore. Four men are employed. Mr. H. G. Shaw, of San Luis Obispo, manager.

## Santa Clara County.

It is an exceptionally fertile county; every variety of fruit and cereal produced in the State is grown within its borders, and usually in large quantities. The broad Santa Clara Valley, which stretches N.W. and S.E. across the county, occupying almost one half its area, is especially well suited for horticulture and agriculture. Subterranean water is prevalent and part of the wells are artesian. The principal mineral products are quicksilver, building-stone, and petroleum, though many other minerals occur, which are of more or less economic importance, as manganese, magnesite, limestone, lignite, mineral waters, etc.

Chromic iron occurs in bunches and seams in the serpentine in the southern part of the county, but is developed only to a very limited extent, and is generally too thinly disseminated or too low grade for its exploitation.

*Greenwall's, T. B., Mine.*—It is in the foothills W. of the S. P. R. R. 16 miles S. of San José, at about 1,100′ elevation. It consists of surface workings and a tunnel 60′ long. A few tons of fair ore lies on the dump. It occurs in bunches of serpentine.

## Shasta County.

*Hull & Jones Mine.*—It is in T. 3 N., R. 4 W., on Shotgun Creek; the chrome-iron deposit is over 20′ thick, and only worked on demand. A good wagon road 1¼ miles long connects with the C. & O. R. R. Several carloads extracted by 4 men have been shipped. Three miles beyond is a second deposit. Sylvester Hull and T. N. Jones, of Hazel Creek, owners.

## Sierra County.

*Brandy City.*—Chromic iron is found on Sec. 1, T. 19 N., R. 8 E.

## Sonoma County.

An unlocated deposit of chromite exists 3 miles W. of Geyserville, south of the wagon road. Another one is found on the land of the Asti Colony, 3 miles S. of Cloverdale. A tunnel was run under the deposit with a view of finding a vein. The nature of such deposits not being understood, no vein was found, and the work abandoned. Some years ago 2,500 tons were shipped from here.

## Tehama County.

This county, situated in the upper part of the Sacramento Valley, and extending on both sides of it far into the mountains, comprises valley, foothill, and mountain lands, used principally for agricultural, horticultural, and grazing purposes. The annual rainfall is large, and the important streams afford ample water for power, irrigation, and domestic purposes. Good water may be had in the Sacramento Valley from wells 15′ to 125′ deep. Mineral springs are abundant, some of which are widely known for their medicinal properties. The lumber industry is an important source of revenue. Chromic iron, "pectolite," indications of oil, and coal occur in the western part, while in the eastern part the sedimentary rocks, probably auriferous, are covered by lava.

*Tehama County Chrome Deposit Co.'s Mine.*—See our Xth and XIIth Reports, pp. 692 and 38. It is situated on the North Fork of Elder Creek, in Sec. 16, T. 25 N., R. 7 W., about 28 miles W. of Red Bluff, at 2,000′ elevation. During 1895 the company mined and shipped 1,500 tons of ore, making a total of 4,500 tons that this deposit has yielded to date. It averages 47% chromium, and sells for $9 per ton, f. o. b. at Red Bluff. There are 18 miners and 31 teamsters employed intermittently. On the company's ground are also deposits of magnesite and a ledge of pectolite, besides indications of coal. Tehama County Chrome Deposit Co., of Red Bluff, owner.

# COAL.

## Alameda County.

*Corral Hollow Mine.*—See our Xth and XIIth Reports, pp. 91 and 9. All information and admittance to the mine was refused our Field Assistant. A standard-gauge railroad from Stockton to the mines was ompleted June 10, 1896.

## Amador County.

*Coal Mine No. 3.*—See our XIIth Report, p. 41. It is 3 miles in a northwesterly direction from Ione. The inclined shaft, in July, 1895, eached 160′ in depth. The third stratum of coal is the one being xploited. Shafts and bore-holes sunk in this region show the country o be underlaid by an extensive stratum of this brown lignite, but Mine No. 3 is the only one at present in operation. The shipment for 1895 was 21,323 tons. Thirty-eight men are employed. Ione Coal and Iron Co., owner; Frank Frates, of Ione, superintendent.

## Contra Costa County.

It is principally an agricultural, fruit-growing, and stock-raising county, though a large part of its revenue is derived from its coal and other mineral industries. It contains important springs, which are noted for their medicinal properties. There has been more or less prospecting for gold and copper about Mount Diablo, and small quantities found, but their exploitations have not been profitable.

*Central Mine.*—See Stewart.

*Empire and Hartley Mines.*—See our VIIth and XIIth Reports, pp. 142 and 44. They are in Sec. 12, T. 1 N., R. 1 E. Idle.

*Mount Diablo Coal Field.*—See our VIIth and XIIth Reports, pp. 118 and 43. The Pittsburg Mining Co.'s mines at Somersville, and the Stewart Mine at Stewartsville, are the only mines in operation.

*Pittsburg Mining Co.'s* (*Somersville*) *Mines.*—See our VIIIth and XIIth Reports, pp. 160 and 44. They are at Somersville, and consist of the *Eureka*, *Manhattan*, *Pittsburg*, and *Union*. The Pittsburg Mine is worked by an 8′x 12′ double-compartment vertical shaft, 600′ deep. It cuts the Clark bed of coal at a depth of 300′, the "Little" bed at 450′, while the Black Diamond bed is supposed to lie 100′ below the bottom of the shaft. A cross-cut runs north from the bottom of the shaft and cuts the "Little" bed 200′ from the shaft, and at 600′ cuts the Clark bed. A gangway runs 210′ W. from the cross-cut on the "Little," and another 500′ E. on the Clark bed. The coal is mined from above and lowered through chutes to the gangways. Sheet-iron is used in the chutes on which to slide the coal. The beds dip uniformly 31° N. The "Little" bed is 2½′ thick and carries varying quantities of carbonaceous shale-bone.

The coal of the "Little" bed extends 300′ above the gangway, while in the Clark bed it has been mined to within about 150′ of the gangway. The Clark bed is uniformly 3½′ thick, inclosed between beds of sandstone, and is quite free from slate, etc. Though a large amount has been mined from this bed in the old workings above water-level, the beds extend E. ¾ mile or more on the company's property, and a vast quantity may yet be obtained. It is principally used for steam purposes on boats, factories, etc. A narrow-gauge railroad conveys the coal from the mine to Pittsburg Landing. The water is allowed to accumulate in lower parts of the mine, and hoisted through the shaft in 500-gal. tanks by a new engine used only for that purpose. About 8 hours per day is required for hoisting water. Since our last report the "Davis" slope has been producing about 1,000 tons per month from the Black Diamond bed, but is now temporarily idle. The company employ 60 men in mining and 20 on the surface. James Rankin, of Martinez, superintendent.

*Star Mine.*—See our XIIth Report, p. 46. It is in Sec. 1, T. 1 N., R. 1 E. Idle.

*Stewart* (*Central*) *Mine.*—See our VIIth and XIIth Reports, pp. 141 and 48. It is on the steep side of a ridge at Stewartsville, at about 500′ elevation. Since our last report the cross-cut on the 1,200′ level has been continued north to the Belshaw bed, 400′ from the bottom of the slope, from which point a 180′ slope has been sunk, following the coal-bed, which dips 25° N. A two-horse-whim is used to hoist cars up the slope to the 1,200′ level. Also, considerable coal has been mined on the 900′ level from a bed which overlies the Black Diamond, and is separated from it by 4′ to 5′ of black shale. It consists of alternate layers of coal and shale, of which the following is a section at the breast of the gangway:

| | |
|---|---|
| Coal | 7″ |
| Bone | 12″ |
| Coal | 15″ |
| Bone | 10″ |
| Total | 3′ 8″ |

The coal is said to be improving as developing progresses. This coal has a tendency to ignite when stored for a time in bulk, and is therefore better used when fresh. The Belshaw bed is 2′ 8″ thick at the bottom of the slope, and the coal is comparatively free from bone. The coal is conveyed to Antioch by rail. Thirty-two men are employed intermittently. M. W. Belshaw, of Antioch, owner.

## Del Norte County.

On the beach, ½ mile S. of Point St. George and 3 miles N. of Crescent City, coal is said to crop out and be visible when the sand is low and the tide out. A large detached piece, lying on the beach, is a true lignite similar to that found all along the coast in recent sandstones. The dip is inland. Borings 1,000′ back from the shore penetrated a vein 3′ thick. The coal has no commercial value; its position makes mining too costly. Peter Emetsberg, of Crescent City, owner.

## Fresno County.

*California Mine.*—See our XIIth Report, p. 50. It is in the Coalinga coal field, in Sec. 22, T. 20 S., R. 14 E., 5 miles N.W. of Coalinga, at about 1,300′ altitude. Since our last report a 400′ slope has been run from the old tunnel, near its mouth, cutting the "little" vein, said to be 9″ thick, and harder than near the surface. The lower workings are now full of water. Idle. R. Ballentine, of Coalinga, superintendent.

*Carey Creek Coal.*—See our XIIth Report, p. 51. No recent developments.

*Del Monte (Drabble) Mine.*—See our XIIth Report, p. 51. It is near the head of a narrow cañon in the Priest Valley coal field, 20 miles W. of Alcalde, near the western boundary of the county, at about 2,400′ altitude. Since our last report the old tunnels and road leading to the mine have been repaired, a boarding-house for miners built, and a new 90′ tunnel run: it starts in a steep ravine, 125′ below the "second tunnel," runs N. 10° E., and penetrates the following strata, which dip 68° N.:

| | |
|---|---|
| Soft gray sandstone | 200′ |
| Light-blue compact clay | 52′ |
| Coal bed No. 1—Carbonaceous shale and seams of coal | 4′ |
| Soft gray sandstone and shales | 28′ |
| Gray compact argillaceous shale | 7′ |
| Coal bed No. 2—Coal and seams of shale | 3′ |
| Sandy shales passing into clay shales | 96′ |
| Total | 390′ |

The breast of the tunnel is probably near coal bed No. 3. Coal bed No. 1 contains too much shale (bone) to be of any economic importance. Bed No. 2 is as follows:

| | |
|---|---|
| Clear coal | 12″ |
| Bone, carbonaceous shale | 5″ |
| Clear coal | 14″ |
| Bone, carbonaceous shale | 5″ |
| Total | 36″ |

The coal of this bed looks well where penetrated by the tunnel, but is said to crumble more or less after it is mined. Bunkers are to be erected below the mouth of the above tunnel. Two men are employed developing. Del Monte Coal Mining Co., owner; R. S. Falconer, of No. 189 Market Street, San Francisco, secretary; R. S. Nelson, of Warthan, superintendent.

*San Joaquin Valley Co.'s Mine.*—See our Xth, XIth, and XIIth Reports, pp. 186, 217, and 52. It is at the head of a narrow ravine, 4 miles N.W. of Coalinga, at about 1,200′ altitude. The developments consist of three tunnels, 300′, 400′, and 1,700′ long, respectively, and a 100′ slope. They are inaccessible, having caved somewhat, and are full of water. The bed of coal worked is said to average 4′ thick, and is comparatively poor. A branch railroad runs from Coalinga to the mine. Idle. E. Kauntz, of Hanford, manager.

## Humboldt County.

In our XIIth Report, pp. 54–56, several discoveries of coal were mentioned, and their occurrence described in detail. The coal found near Hydesville and on Maple Creek will probably prove to be commercially valuable, but no work has been done at either place since 1893.

## Los Angeles County.

*Carbon Hill Oil and Coal Co.*—See our IXth Report, p. 204. Assessment work only. A. S. Longley, of No. 338 S. Broadway, Los Angeles president.

## Mendocino County.

*Eel River Mine.*—Fully described in our XIIth Report, p. 57. It is situated on Middle Fork of Eel River, 4 miles N. of Carey. A new railroad survey was made in the summer of 1894 from Fort Bragg, passing the mine to Round Valley, and the promoters expect to start building in the immediate future. Fort Bragg Lumber Co., San Francisco, agents.

*Round Valley.*—See our XIIth Report, p. 58.

*Thomas Mine.*—See our XIIth Report, p. 58. It lies on Salt Creek 2½ miles N. of Carey. Idle.

## Monterey County.

Coal crops out in a number of places in this county, and some development work was done a few years ago, but no coal is now being produced.

*Carmel Mine.*—See our VIIIth and Xth Reports, pp. 414 and 347. It is about 14 miles S. of Monterey and 2 miles from the coast, at 1,000 altitude. It is said that there are three beds of good coal in the mine and that 20,000 tons have been mined. The workings are inaccessible. Idle. A. Bassett, of Pacific Grove, superintendent.

*Priest Valley Coal Fields.*—See our XIIth Report, p. 59. It is in the southeastern part of the county. A number of beds of coal outcrop and extend S.E. into Fresno County. The coal is in a sandstone and shale formation, and dips 40° N.E. It is too far from shipping facilities to be of economic importance at present.

*Stone Cañon.*—See our VIIth, VIIIth, and XIIth Reports, pp. 172, 403 and 59. It is in the southern part of the Priest Valley region, and 20 miles N.E. of San Miguel. A thick bed of coal is said to exist there which is hard enough to stand handling. Some development work was done a few years ago. Idle.

## Riverside County.

*Elsinore (Chaney) Coal Mine.*—See our XIIth Report, p. 60. It is 6 miles W. of Elsinore. The mine is in operation, but not producing as largely as formerly, owing to decreased demand, petroleum having superseded coal as fuel to a large extent in Southern California. Elsinore Coal and Clay Co., of Los Angeles, owner; D. W. McCrea, of Elsinore, superintendent.

## San Benito County.

Coal outcrops in a number of places in the southern part of this county, but at present is too great a distance from shipping facilities to be economically important.

*Oat Cañon.*—See our XIIth Report, p. 61. In T. 19 S., R. 11 E., in the southern part of the county, coal outcrops in a number of places

nd a 5′ bed of inferior quality is said to have been struck in a tunnel few years ago. No recent developments.

*San Benito (Trafton) Mine.*—It is in San Benito Valley, Sec. 21, T. 7 S., R. 10 E., 45 miles S.E. of Hollister, and at about 2,600′ altitude. The bed of coal is 4½′ thick at the surface, and said to be 6′ in the bottom of the 130′ shaft. It is overlaid by brown ferruginous shale, and underlaid by massive, soft, brown sandstone, dipping 32° N.W. It has a tendency to crumble by handling, and is suitable for fuel only, principally for steam purposes where stationary boilers are used. It is said to have been tested at the pumping plant of the Hollister waterworks, and found to be equal to the best coal in the market for steam purposes. The mine is worked by an incline shaft, 130′ deep; now full of water. Idle. G. Nash, of Hollister, owner.

## Shasta County.

*Cow Creek.*—In Sec. 12, T. 33 N., R. 2 W., there is a coal outcrop about 20′ thick, including the intermediate thin clay seams; the largest seams are 2½′ and 15″ thick, and of a fair quality.

Near *Eiler's* place, N. of Little Creek, are coal exposures.

## Siskiyou County.

Seven miles S.E. of Glazier, on the Sisson and Fall River Mills stage road, at the headwaters of Kosk Creek, 2 miles below the forks, in unsurveyed T. 38 N., R. 1 E., M. D. M., lies an isolated area of sandstone, 4 miles by 2½ miles in extent, carrying several beds of coal. One, about 4′ in thickness, crops out along the right bank of Big Cañon or Kosk Creek for a distance of nearly 2 miles. A second bed, 5′ thick and about 150′ above, crops out and crosses Colby Creek, a feeder to Kosk Creek. Other smaller seams and outcrops are visible in this section. These beds have a sandstone roof and clay floors, and dip about 15° into the mountain. The lower bed lies at 3,350′ approximate elevation; 3,500′ at the upper outcrop; and 5,325′ at the top of the sandstone where it flanks on the McLoud Mountain. About twenty-four claims have been filed on these lands. With exception of a 15′ tunnel on the A. D. Bartle claim, no developments worth mentioning have been made.

Four miles W. from Ager, on the C. & O. R. R., at 1,400′ approximate elevation, on Mrs. Wise's land on the southeastern slope of Black Butte Mountain, are 140 acres that show a 34″ vein of coal, under sandstone. Some work was done here several years ago, but as the coal was found to contain an excess of ash, no further developments have been made. Mrs. W. Wise, of Ager, owner.

*Siskiyou Coal Mining Co.*—See our XIIth Report, p. 61. It is on Willow Creek, about 4 miles E. of Henley. Idle. D. Horn, of Hornbrook, president.

## Sonoma County.

No mines are being worked in the county, although a number of coal seams are known. See our XIIth Report, pp. 61–62.

*O'Donnell's Mine.*—This mine, so much heralded in the newspapers, lies ½ mile W. of Glen Ellen, and proves to be nothing but a seam of black clay, colored by carbonaceous matter.

## Sutter County.

See our Xth and XIth Reports, and Bulletin No. 3, pp. 691, 471, and 9
A limited quantity of coal is said to have been obtained from seams and pockets in shales which flank the Marysville Buttes, but there have been no recent developments.

## Trinity County.

A 4½′ stratum of a soft, fat lignite, highly valued by the miners, has been uncovered by the mining operations in the Wiltshire hydraulic claim, at Big Bar P. O. It appears to dip 20° N., and under the river. The cropping is exposed for 200′, and it will not exceed probably more than a few acres in extent.

*Hay Fork Valley Coal Field.*—See our XIIth Report, p. 62.

*Hyampom Valley.*—See our XIIth Report, p. 62.

*Poison Camp.*—See our XIIth Report, p. 63.

# COPPER.

## Amador County.

*Newton Mine.*—Fully described in our VIIIth Report, p. 106. It is ¼ miles N.E. of Ione, on the road to Jackson, at 650′ elevation. The average width of the vein is 7′ to 8′, and it courses a little E. of N., and dips 62° easterly. There are two shafts upon the property, 430′ and 150′ deep. Hoisting works, etc., gone to decay. Idle.

## Calaveras County.

The copper industry of this county is still practically at a standstill. At the Campo Seco and Copperopolis mines the leaching of the old ore-piles is the only work in progress. It was expected that with the improvement in price, mining operations would be resumed, but as yet nothing in this direction has been done.

*Campo Seco Mine.*—See Penn Chemical Works.

*Hecla* (*Copper Hill*) *Mine.*—See our VIIIth Report, p. 156. It is 2 miles N.W. of Campo Seco, and adjoins the Campo Seco Mine on the north. Idle.

*Penn Chemical Works or Campo Seco Mine.*—See our VIIIth Report, p. 152. It is 1½ miles N.W. of the village of Campo Seco. Leaching old ore-piles only. Penn Chemical Works, of San Francisco, owner; C. Borger, of Campo Seco, superintendent.

*San Francisco Mine.*—See our VIIIth Report, p. 156. It is 1 mile N.W. of Campo Seco, adjoining the Campo Seco Mine on the south. Idle.

*Union* (*Keystone*) *Mine.*—Fully described in our VIIIth and XIth Reports, pp. 150–152 and 167. It is at Copperopolis. Idle. G. McM. Ross, of Copperopolis, superintendent.

## Del Norte County.

Copper ores are found in this county in a belt of hard gray serpentine, a mile wide, which crosses the mountains in a N. and S. direction. It can be traced from Bald Hill to the State line, and far into Oregon. The principal discoveries were made thirty years ago near Low Divide, 10 miles E. of Smith River Corners and about 8 miles N. of Gasquet. The mines, after being worked extensively for several years, were shut down when the price of copper declined, and until recently have been idle.

*Alta Mine.*—See our Xth and XIth Reports, pp. 167 and 198. This property lies on the divide between Hardscrabble and Rowdy creeks, 10 miles E. of Smith River P. O., at 2,000′ altitude. It has been worked extensively in former years, the deepest workings being 700′ below the surface. Idle. Bacon & Co., of San Francisco, owners.

*Aurora Mine.*—This lies E. of the Alta, at 2,050′ altitude, and is a new location on the old Copper Hill property. The country rock is gray serpentine. The new shaft is 70′ deep, and shows a vein of rich sulphurets of copper and iron, 6′ thick. It courses N.E. and S.W., and dips 45°. The hillside below the croppings of the vein is littered with ore rich in oxide of copper, and said to assay 40% copper. Idle. D. R. Miller, of Crescent City, owner.

*Aurora Extension Mine.*—It lies N.E. of the Aurora, at 2,100′ elevation, and is also a new location on the Copper Hill property. Some shallow surface work exposes a 6′ vein, carrying carbonate and black oxide of copper. Idle. A. B. Townsend, of Crescent City, owner.

*Condon Mine.*—See our Xth and XIth Reports, pp. 167 and 198. It is at Big Flat, 25 miles E. of Crescent City. Idle.

*Occidental Mine.*—It lies 10 miles E. of Smith River P. O., and S. of the Alta Mine, at 1,440′ to 1,650′ elevation. The property was relocated in 1895, and embraces the following claims: *Lookout*, *Lookout Extension*, *Pride of Del Norte*, and *Pride of the West*. The country rock is serpentine. The old workings, which are quite extensive, have caved. The present owners were engaged in cleaning out the shafts and drifts, and retimbering them where necessary. The vein courses N. and S., and dips 30° to 80° E. It is from 4′ to 12′ wide, and carries red and black oxides near the surface, which change to pyrite, tetrahedrite, and metallic copper below. John Murray et al., of Crescent City, owners.

*Union Mine.*—It is near the Occidental, and at 1,800′ altitude. The claim contains 20 acres, and was relocated in 1895. The owners were cleaning out and retimbering the old workings, which consisted of an 800′ cross-cut tunnel No. 1, with a 300′ drift on the vein; a 600′ cross-cut tunnel No. 2, and a 75′ shaft, all in ore. The vein courses N.E., dips about 50° E., and carries oxides and sulphides of copper. J. A. Murphy et al., of Crescent City, owners.

## El Dorado County.

*Cosumnes Copper Mining Co.'s Mine.*—It is on the Middle Fork of the Cosumnes River, 4 miles E. of Fairplay, at 1,950′ elevation, and comprises four claims, two of which are patented. The vein, from 10′ to 17′ wide, strikes N. and S., and dips vertically between granite on the west and mica schist on the east. Beyond the mica schist wall is a belt of marble 500′ across. There is a 200′ tunnel, slightly caved at the entrance, which is being reopened. The vein carries "peacock" ore, malachite, copper-glance, molybdenite, also galena and other sulphurets. The general average of the ore is about 15% copper; choice specimens are said to yield 19 ozs. silver, $6 gold, and 50% to 52% copper per ton. Four men are at work. An incorporated company, of Placerville, owner; E. Bind, of Placerville, superintendent.

## Fresno County.

*Ackers Mine.*—It is on Pine Flat, 10 miles S.E. of Letcher, at 1,500′ altitude. The vein is 8′ wide, dips 60° E., and lies between syenite walls. The ore is chalcopyrite and black oxide. Development consists of a tunnel 50′ long, and a shaft 36′ deep. Henry Ackers, of Sanger, owner.

*Copper King Mine.*—See our XIIth Report, p. 66. This is on Dog Creek, 5 miles S.E. of Letcher, at 1,540′ altitude. The vein is 5′ to 7′ wide, and consists of a solid mass of chalcopyrite with a little zinc-blende, galena, and about $5 in gold per ton. The dip is 40° E. The hanging-wall is hornblende schist, while the foot-wall seems to be a dike, altered to talcose slate. Near the surface the vein is filled with hydrous oxide of iron, not a trace of copper being visible. The developments consist of a tunnel 200′ along the vein, and a shaft 60′ deep. Idle at present, awaiting the erection of a pump and hoist. Hugh Knipper, of Letcher, owner; P. F. Jansen, of Letcher, superintendent.

## Humboldt County.

*Red Cap Creek Mine.*—See our XIIth Report, p. 66. Abandoned.

## Madera County.

The belt of copper mines lying in the lower foothills, and extending from Buchanan to Green Mountain, are still idle. These deposits occur as a mineralization of mica schist and other crystalline rocks. Copper, also, is found in considerable quantity in the mines of the North Fork Mining District, near the head of the San Joaquin River. See our XIth Report, p. 219.

## Marin County.

*Bolinas Mine.*—See our XIth Report, p. 253. It lies 1 mile E. of Dogtown, at Bolinas Bay. This property, after lying idle many years, is being prospected by a shaft sunk in the bottom of Union Gulch. It is 35′ deep, shows a 12′ vein carrying sulphurets of copper and iron between walls of sandstone.

## Mendocino County.

*Native Copper Mine.*—See our XIIth Report, p. 67. It lies on Red Mountain, 12 miles S.E. of Ukiah. No recent developments. C. H. Stout, of Ukiah, owner.

*Salinas* (*Red Buck*) *Mine.*—See our XIIth Report, p. 67. This property lies on Red Mountain, 15 miles S.E. of Ukiah, and consists of four full claims, viz., the *Igurnia*, *Leland*, *Ella*, and *Salinas*. The 3′ vein is well defined, strikes N.W., and dips 70° N.E. in serpentine. The ore shows metallic copper in sheets and grains; also, oxides and carbonates. The developments consist of a 20′ shaft and several open cuts. Dr. G. W. Stout, of Ukiah, owner.

*Thomas Mine.*—See our XIIth Report, p. 67. It lies on Bratt Ridge, 3 miles S. of Carey. Considerable prospecting has been done to find the vein. A tunnel, 100′ long, has been run into the ridge, but work was discontinued on account of expense. A trench was then started running up the hill until the soil became too deep for an open cut. Next, water was brought in through a ditch ¼ mile long, and the surface soil was, in 1895, being piped off with hose and nozzle under heavy pressure. The ore is a mass of sulphurets of iron and copper, nearly free from gangue. W. T. Thomas, of Ukiah, owner.

## Nevada County.

*Imperial Paint and Copper Co.*—See our Xth, XIth, and XIIth Reports, pp. 392, 313, and 67. It is in Secs. 26 and 35, T. 15 N., R. 6 E., in Spenceville, at 575′ elevation, and comprises 214 acres. Since our previous report the large pit has been emptied of the water, exposing the large bodies of sulphide ore. The present output is 2 tons of cement copper per month, and 300 tons of paint. Seven men are employed. An incorporated company of No. 504 Kearny Street, San Francisco, owner; Otto Woehler, of Spenceville, superintendent.

*Jackson Mine.*—It is 2½ miles N.E. from Spenceville, at 750′ elevation, and comprises a full claim, adjoining the Mineral Hill. It is only a prospect with a 50′ tunnel. — Jackson, of Spenceville, owner.

*Mineral Hill Mining Co.'s Mine* (Quartz).—See our XIIth Report, p. 67. It is in Sec. 13, T. 15 N., R. 6 E., 2½ miles N.E. from Spenceville, at 750′ elevation, and comprises four claims, designated *Golden Eagle, Index, Legion,* and *Mineral Hill.* There are thirteen vein outcrops on the property having a strike of N. 26° W., and an easterly dip, and varying in width from 2′ to 30′. The front veins have been proved to carry a paying amount of gold with the predominating copper ores. On the Golden Eagle are six shafts and a tunnel; on the Index a tunnel, now being run, has attained 300′ in length with 170′ perpendicular depth at the breast. The deepest shaft is 200′ perpendicularly. Eight men are employed. An incorporated company of No. 210 Sansome Street, San Francisco, owner; C. C. Bitner, of Spenceville, superintendent.

## Plumas County.

*Cosmopolitan Mine.*—See our XIIth Report, p. 68. Idle.

*Engel Mines.*—See our XIIth Report, p. 68. Assessment work only.

*Pocahontas Mine.*—See our XIIth Report, p. 69. Idle.

## Riverside County.

Several copper prospects have been opened superficially in the low hills N.E. of South Riverside, and in the rugged brush-covered hills S.W. of the town. The ore is very low grade. J. Irving Crowell, of South Riverside, owner.

## San Bernardino County.

*Amazon Mine.*—See our XIth and XIIth Reports, pp. 363 and 69. It is 5 miles E. of Oro Grande, and has a 65′ shaft, some drifts, and several superficial cuts. Only assessment work is done. Estate of H. Easton, of Oro Grande, owner.

*Copper Bullion Mine.*—It is 1½ miles W. of Manvel, at 5,000′ elevation. The ore-shoots are extremely irregular in shape and size, and occur in limestone. The ore is chiefly chrysocolla and chalcopyrite. An incline has been sunk 40′ at one place, and several cuts made on a succession of deposits, which have a N.W. strike and a S.W. dip. W. G. Hickson, of Manvel, owner.

*Copper World Mine.*—It is a prospect, 55 miles N.W. of Vanderbilt· H. Boyd, of San Bernardino, owner.

*Dry Lake District.*—Some rich copper ore was developed in Dry Lake istrict, 15 miles N.E. of Old Woman's Springs, some years since, but othing except prospect holes sunk on the vein. The ore is copper ance and carbonate.

*Mescal District.*—It is 20 miles W. of Vanderbilt. There are large eposits of low-grade ores in this district, and within the past year a rge number of claims have been located, but only prospecting work as done. There are also gold and silver prospects in the district.

*Monument District.*—It is 60 miles below The Needles, near the Colo-ado River. Large deposits and veins containing copper ores are found the district, and a large number of claims have been located. They re all in the prospective stage, however.

*Ord Mountain District.*—See our VIIIth, IXth, Xth, and XIIth eports, pp. 500, 232, 528, and 69. There are many copper prospects the district, all of which are low grade. Considerable work has been one on them in past years, but all are at present idle. J. B. Osborne, Daggett, owner.

*Tiptop Mine.*—See our XIth and XIIth Reports, pp. 354 and 69. It in Lava Beds District, 35 miles E. of Daggett and 10 miles S. of avic. The mine is worked through adits. The ore is chalcopyrite nd bornite, carrying, it is said, about 15 ozs. silver per ton. Shipments re made occasionally, usually to Swansea, via San Francisco. W. N. Iasters et al., of Cleveland, Ohio, owner; Willis Steadman, of Daggett, uperintendent.

## Shasta County.

*Balakalala Mines.*—See Balaklava in our XIIth Report, p. 245. They re 7 miles N.W. of Copley, at 2,330′ elevation, and comprise eleven laims, with a general N.W. course, showing a pronounced gossan out-rop, spreading in places to over 100′ in width. The formation extends hrough many miles of country, including, on its course, the Iron Iountain Mine, Stowell Mine, Windy Camp group, etc. The ore-bodies re remarkable for the large masses of solid sulphides, carrying iron, opper, silver, and some gold. Tunnels have been driven at different evels on the ore-bodies, and a few shallow shafts sunk along the out-rop 24′ and 90′ deep; the tunnels penetrate 800′, 200′, 80′, and 70′. pportunity for deep tunnel workings are exceptionally favorable from he Squaw Creek side of the mountain. The company own a water-ight of 400 inches on North and South Squaw creeks, which may be elivered under 650′ pressure through 2½ miles of flume. Only sample sts of the ore have been worked. Six men are at work. W. M. Murray t al., of Shasta, owners. (See plan on next page.)

*Blue Jacket Mine.*—See our XIIth Report, p. 69. It is in Sec. 25, . 34 N., R. 4 W., and 1 mile E. of the United States fishery on McCloud iver.

*Copper City* (*Bully Hill*) *Mine.*—It is 3 miles N. of Copper City, and omprises three claims. The ore-bodies range N.E. and S.W., and arry copper, silver, and gold. It has been reopened during the last ear, by cleaning out the old tunnels and driving a new tunnel to cut he vein 275′ below the surface, which is now in over 200′. Ten men are

PLAN OF BALAKALALA, WINDY CAMP AND STOWELL GROUP OF MINES.
T. 33 N. R. 6 W. M. D. B. & M.
Sec. 13
Sec. 14
Sec. 24
Sec. 23
Morning Star
North Star
Balakalala
Rockfellow
Stanford
Gipsy Eagle
Vanderbilt
Silver Bell
Harrison
Astor
El Monte
Huntington
Geo. Gould
Fortune
Crocker
Alice
Mule
Cold Stream
Huckleberry
Feldspar
Windy Camp
Cleveland
Cold Water
Webster
Madison
Hornet
Delta
Grub
Grub
Raven

mployed. H. McDonnel et al., of San Francisco, owners; J. Sallee, f Copper City, superintendent.

*Mountain* (*Iron Mountain*) *Mines* (*Limited*).—See our XIIth Report, . 377. These mines are on Iron Mountain, 8 miles N.E. of Shasta, at ,400′ elevation, and comprise three claims. Since our last report the roperty has passed into the hands of an English company, which has onstructed 10.7 miles of 3′ narrow-gauge railroad from the mine to Keswick, a point 1 mile above the S. P. R. R., where a 100-ton smelter nd other necessary buildings have been erected. From the main line o Keswick the road carries three rails to accommodate both standard-auge and narrow-gauge cars. The maximum grade is 3½°, and to pre-ent accidents from runaway cars, two derailing switches have been nserted, one above and the other below Keswick. The present rolling-tock consists of 2 locomotives, 10 dump cars, and 2 flat cars. Sup-lies will be taken direct from the S. P. Co.'s line to both smelter and nine, and the ores loaded on the cars in the mine are delivered at the melter; 100,000 tons of ore can be stored at the smelter, and the hand-ing of the ores, slag-pots, etc., will be done by hydraulic machinery. )ver 150,000 lbs. of steel and iron have been used to date in the con-truction of the furnace. A 40 Kilowatt dynamo furnishes the power equired at present. All information concerning, and admission to the nine, was refused. In November, 1895, the company was employing ,200 men on the road, smelter, and mine. The process of smelting, as irst practiced, was a failure. It is said that after months of experi-nenting a satisfactory process has been adopted and the smelters are ıow running smoothly. The Mountain Mines Co. (Limited), of London, )wner; Alex. J. Hill, of Keswick, manager.

*Kosk Creek Mines.*—They are a late discovery, situated in Secs. 23 and 24, T. 37 N., R. 1 W., on Kosk Creek, near the "big bend" of Pitt River, ıt 2,000′ elevation. The creek cuts through the formation for a distance )f 1,800′, along 65′ of which the formation, an igneous rock, carries :opper sulphurets with native copper. The course of the mineralized )ody is N.E. and S.W. There are fourteen claims. A shaft has been unk 15′, and a tunnel started near the creek-level. Clay and F. Taylor :t al., of Redding, owners.

*Peck Mine.*—See our XIIth Report, p. 70. It is at Furnaceville, and ıdjoins the Afterthought on North Cow Creek. Idle.

*Windy Camp* (*Huckleberry*) *Mines.*—They are 7 miles N.W. of Copley, ıt 2,410′ elevation at lowest workings, 2,550′ at upper workings, and :omprise thirteen claims, on the same ore-body as the Iron Mountain ınd Balakalala mines. They carry the same metals—iron, copper, silver, ınd gold. Eight different tunnels have been started at different levels )n the ore-body, none, however, of any great extent. Four men are :mployed. W. M. Murray et al., of Shasta, owners; — Weil, of Copley, ;uperintendent.

## Sierra County.

*Depot Hill Mine.*—It is 5 miles N. of Camptonville. There are seams of :opper ore not worked.

## Siskiyou County.

*Richie Mine.*—It lies on Boulder Creek, 3½ miles S.W. of Callahan, a 4,720′ elevation. The vein is from 2′ to 6′ wide, and dips 80° N.W The ore is quartz, carrying copper ores—bornite, chalcopyrite, an malachite. Idle.

## Trinity County.

*Nonpareil Mine.*—It is on the East Fork of New River, 8 miles E. o Francis, at 2,400′ altitude. The developments consist of a 35′ tunnel and several open cuts. The vein is 4′ wide and dips 26° E. The foot wall is slate and the hanging-wall porphyry. The ore is sulphurets c copper and iron, with a little gangue. Idle. C. S. McAtes, of Francis owner.

## Tulare County.

*Page Mine.*—See our XIIth Report, p. 297. It lies in a low ridge c hills, 7 miles N.E. of Visalia. The vein is 4′ thick, and is filled wit silicious matter, impregnated with copper pyrite, and carrying a trac of gold. Idle. J. Prothers, of Visalia, owner.

## TOTAL PRODUCTION OF GOLD IN CALIFORNIA SINCE 1848, BY YEARS, ACCORDING TO DIFFERENT AUTHORITIES.

[Silver contained in gold has been parted and is not included in the tables.]

A great deal of interest having been manifested and considerable diversity of opinion expressed as to the total amount of gold produced in California, the following table has been collated, from the best known authorities,

BY CHARLES G. YALE, STATISTICIAN.

| Year. | J. D. Whitney. (a) | J. Ross Browne. (b) | J. Arthur Phillips. (c) | U. S. M'g Report. (d) | W. P. Blake. (e) | R. W. Raymond. (f) | J. J. Valentine. (g) | L. A. Garnett. (h) | U. S. Mint. (i) | Chas. G. Yale. (j) | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1848 | $5,000,000 | | $10,000,000 | $10,000,000 | | | | $245,301 | | $245,301 | 1848 |
| 1849 | 20,000,000 | $4,921,250 | 40,000,000 | 40,000,000 | $66,000,000 | | | 10,151,360 | | 10,151,360 | 1849 |
| 1850 | 45,000,000 | 27,676,346 | 50,000,000 | 50,000,000 | | | | 41,273,106 | | 41,273,106 | 1850 |
| 1851 | 65,000,000 | 42,582,695 | 55,000,000 | 55,000,000 | 45,989,000 | | | 75,938,232 | | 75,938,232 | 1851 |
| 1852 | 62,500,000 | 46,588,434 | 60,000,000 | 60,000,000 | 45,779,000 | | | 81,294,700 | | 81,294,700 | 1852 |
| 1853 | 62,500,000 | 57,330,031 | 65,000,000 | 65,000,000 | 54,965,000 | | | 67,613,487 | | 67,613,487 | 1853 |
| 1854 | | 51,328,653 | 60,000,000 | 60,000,000 | 52,045,633 | | | 69,433,931 | | 69,433,931 | 1854 |
| 1855 | | 45,182,631 | 55,000,000 | 55,000,000 | 45,161,731 | | | 55,485,395 | | 55,485,395 | 1855 |
| 1856 | | 48,880,543 | 55,000,000 | 55,000,000 | 50,697,434 | | | 57,509,411 | | 57,509,411 | 1856 |
| 1857 | | 48,976,697 | 55,000,000 | 55,000,000 | 48,976,692 | | | 43,628,172 | | 43,628,172 | 1857 |
| 1858 | | 47,548,025 | 50,000,000 | 50,000,000 | 47,548,026 | | | 46,591,140 | | 46,591,140 | 1858 |
| 1859 | | 47,649,462 | 50,000,000 | 50,000,000 | 47,640,462 | | | 45,846,599 | | 45,846,599 | 1859 |
| 1860 | | 42,203,345 | 45,000,000 | 45,000,000 | 42,325,916 | | | 44,095,163 | | 44,095,163 | 1860 |
| 1861 | | 40,639,080 | 40,000,000 | 40,000,000 | 40,676,758 | | | 41,884,995 | | 41,884,995 | 1861 |
| 1862 | | 42,561,761 | 34,700,000 | 34,700,000 | 42,561,761 | | | 38,854,668 | | 38,854,668 | 1862 |
| 1863 | | 46,071,920 | 30,000,000 | 30,000,000 | 46,071,920 | | | 23,501,736 | | 23,501,736 | 1863 |
| 1864 | | 55,707,201 | 26,600,000 | 26,600,000 | 56,707,201 | | | 24,071,423 | | 24,071,423 | 1864 |
| 1865 | | 44,984,546 | 28,500,000 | 28,500,000 | 45,308,227 | | | 17,930,858 | | 17,930,858 | 1865 |
| 1866 | | | 26,500,000 | 25,500,000 | 41,364,393 | | | 17,123,867 | | 17,123,867 | 1866 |
| 1867 | | | | 25,000,000 | 41,676,292 | | | 18,265,452 | | 18,265,452 | 1867 |
| 1868 | | | | 22,000,000 | | $22,000,000 | | 17,555,867 | | 17,555,867 | 1868 |
| 1869 | | | | 22,500,000 | | 22,500,000 | | 18,229,044 | | 18,229,044 | 1869 |
| 1870 | | | | 25,000,000 | | 25,000,000 | $17,500,000 | 17,458,133 | | 17,458,133 | 1870 |
| 1871 | | | | 20,000,000 | | 20,000,000 | 19,447,354 | 17,477,885 | | 17,477,885 | 1871 |
| 1872 | | | | 19,000,000 | | 19,049,098 | 18,143,314 | 15,482,194 | | 15,482,194 | 1872 |
| 1873 | | | | 17,000,000 | | 18,025,722 | 17,280,951 | 15,019,210 | | 15,019,210 | 1873 |
| 1874 | | | | | | 20,300,531 | 17,617,124 | 17,264,836 | | 17,264,836 | 1874 |
| 1875 | | | | | | 17,753,151 | 16,326,211 | 16,876,009 | | 16,876,009 | 1875 |
| 1876 | | | | | | | 16,099,559 | 15,610,723 | | 15,610,723 | 1876 |
| 1877 | | | | | | | 15,237,729 | 16,501,268 | | 16,501,268 | 1877 |
| 1878 | | | | | | | 17,306,508 | 18,839,141 | | 18,839,141 | 1878 |
| 1879 | | | | | | | 17,166,166 | 19,626,654 | | 19,626,654 | 1879 |
| 1880 | | | | | | | 17,745,745 | 20,030,761 | $15,618,361 | 20,030,761 | 1880 |
| 1881 | | | | | | | 17,166,676 | 19,223,155 | 18,200,000 | 19,223,155 | 1881 |
| 1882 | | | | | | | 15,470,325 | 17,146,416 | 16,800,000 | 17,146,416 | 1882 |
| 1883 | | | | | | | 13,841,297 | 17,256,873 | 14,120,000 | 24,316,873 | 1883 |
| 1884 | | | | | | | 12,896,594 | | 13,600,000 | 13,600,000 | 1884 |
| 1885 | | | | | | | 12,338,014 | | 12,661,044 | 12,661,044 | 1885 |
| 1886 | | | | | | | 13,208,034 | | 14,716,506 | 14,716,506 | 1886 |
| 1887 | | | | | | | 11,836,957 | | 13,588,614 | 13,588,614 | 1887 |
| 1888 | | | | | | | 10,076,091 | | 12,750,000 | 12,750,000 | 1888 |
| Forw'd | $260,000,000 | $740,832,623 | $836,300,000 | $985,800,000 | $864,495,446 | $164,628,502 | $296,704,649 | $1,100,337,165 | $132,054,525 | $1,174,713,333 | Forw'd |

TOTAL PRODUCTION OF GOLD IN CALIFORNIA SINCE 1848—Continued.

| Year. | J. D. Whitney. (a) | J. Ross Browne. (b) | J. Arthur Phillips. (c) | U. S. M'g Report. (d) | W. P. Blake. (e) | R. W. Raymond. (f) | J. J. Valentine. (g) | L. A. Garnett. (h) | U. S. Mint. (i) | Chas. G. Yale. (j) | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Forw'd | $260,000,000 | $740,832,623 | $836,300,000 | $985,800,000 | $864,495,446 | $164,628,502 | $296,704,649 | $1,100,337,165 | $132,054,525 | $1,174,713,333 | Forw'd |
| 1889 | | | | | | | 10,329,044 | | 11,212,913 | 11,212,913 | 1889 |
| 1890 | | | | | | | 9,896,851 | | 12,309,793 | 12,309,793 | 1890 |
| 1891 | | | | | | | 10,455,488 | | 12,728,869 | 12,728,869 | 1891 |
| 1892 | | | | | | | 10,361,486 | | 12,571,900 | 12,571,900 | 1892 |
| 1893 | | | | | | | 11,172,036 | | 12,422,811 | 12,422,811 | 1893 |
| 1894 | | | | | | | 12,540,646 | | 13,923,281 | 13,923,281 | 1894 |
| 1895 | | | | | | | 14,004,108 | | 15,334,317 | 15,334,317 | 1895 |
| Totals | $260,000,000 | $740,832,623 | $836,300,000 | $985,800,000 | $864,495,446 | $164,628,502 | $375,464,308 | $1,100,337,165 | $222,558,409 | $1,265,217,217 | Totals |

(a) From Whitney's Metallic Wealth of the U. S.: Philadelphia, 1854, p. 147.

(b) This table, from U. S. Mining Commissioner J. Ross Browne's Report of 1867, p. 50, shows only the amount of treasure actually manifested for exportation from San Francisco in the respective years. Mr. Browne, however, allows $45,000,000 for money in use on the Pacific Coast and $5,000,000 for nuggets and specimens. There were no manifests at the port in 1848, and Mr. Browne estimates the actual gold product of the years 1848–49–50 as about $100,000,000. He puts down the amount unmanifested in 16 years at about $200,000,000. He estimates the total product of the Coast up to the end of 1865 as $1,000,000,000, all from California except $100,000,000, which was from Nevada, Idaho, Oregon, Arizona, Washington, and British Columbia. This would leave Mr. Browne's estimate of the entire gold yield of California to the end of 1865 as $900,000,000 instead of the apparent total given in the table.

(c) From "Mining and Metallurgy of Gold and Silver," by John Arthur Phillips: London, 1867, p. 66.

(d) This is a frequently quoted table from U. S. Mining Commissioner Raymond's Report of 1873, p. 543, which he states is "compiled from various sources." Up to 1865 it is identical with that of J. Arthur Phillips. In the remaining years the figures do not always agree with those given officially in Mr. Raymond's Annual Reports, though in some years they are the same.

(e) From Blake's Report on the Precious Metals (Paris Exposition, 1867): Washington, 1869, p. 20. Prof. Blake was Commissioner from California to the Exposition. The table shows exports of treasure from San Francisco for the years given. Prof. Blake adds 10 per cent for unmanifested bullion, $45,000,000 for coin in circulation and gold used in the arts, deducts treasure received from British Columbia, Mexico, etc., and estimates the total product of Pacific Coast to 1868 as $961,000,000. Of this total, he estimates the yield of gold in California from 1848 to 1868 as $807,000,000. Another table giving these same figures of export from San Francisco, accompanied by a statement purporting to be based on estimates of W. P. Blake, will be found in the volume on Precious Metals of the 10th Census, p. 380. The estimate column corresponds with the table of J. Arthur Phillips to 1859, and from there to 1863 the annual amounts differ. Prof. Blake tells the compiler of this sheet, however, that "my final table in the work on Precious Metals I have always regarded as the most accurate figures obtainable."

(f) This statement is compiled from the several Annual Reports of U. S. Mining Commissioner Raymond during his term of office.

(g) These figures are from the Annual statements of John J. Valentine, of Wells, Fargo & Co.'s Express, and represent the gold dust and bullion carried by express each year, with a percentage added for that carried by other conveyances. The record was not kept in this way before 1870. These figures have been revised by Mr. Valentine for this statement.

(h) From Bowie's "Practical Treatise on Hydraulic Mining in California": New York, 1885, p. 288. The table was compiled by Louis A. Garnett, for many years manager of the San Francisco refinery, who had abundant opportunity to eliminate some of the inaccuracies which have crept into published statements, and which have been adopted and repeated by subsequent statisticians. This table is made up for fiscal years, so the data might conform to official reports.

(i) From Annual Reports of the Director of the U. S. Mint. The figures given are those from the recapitulation tables at the end of the chapters on California, in the several Reports.

(j) This complete table to date is compiled from estimates of L. A. Garnett and the U. S. Mint Director's Reports, these being considered by the compiler the most correct and complete of any extended continuous statements. Mr. Garnett's figures are for fiscal, and those of the Mint for calendar, years. To account for the omission of the final six months of 1883 in Mr. Garnett's table, half of the total of that year's full figures of the Mint are added to his statement of the year, which will account for the apparently excessive product of 1883 as given. On consultation with Mr. Garnett, it was agreed that this was the only feasible method of reconciling the difference of fiscal and calendar years, in combining the two tables.

NOTE.—A table made up of the separate estimates of Blake in the 10th Census, p. 380, of Raymond in the U. S. Mining Commissioner's Report of 1873, p. 543, and of John J. Valentine, of Wells, Fargo & Co., added together, make a total to January 1, 1896, of $1,266,091,886; while that compiled by Yale from the estimates of Garnett and the U. S. Mint Reports to January 1, 1896, makes a total of $1,265,217,217. There is, therefore, only a difference in the two sets of estimates of $874,669, which is remarkably close, and shows that the aggregate in the last column is reasonably correct, considering the large amount, and the period covered by the table.

# GOLD.

## Alameda County.

In driving tunnels on the land of the California Improvement Co. ee Macadam), gold is said to have been found in the basalt to the value several dollars per ton.

## Alpine County.

No active mining has been carried on in this county during the period vered by this report.

MILLS IN ALPINE COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hours, in Tons. |
|---|---|---|---|---|
| lorado No. 2 | Steam | 20 | 600 | 40 |
| xchequer | Steam | 18 | 700 | 30 |
| oneer | Steam | 10 | 800 | 20 |

## Amador County.

The general revival of interest in mining has noticeably affected this unty during the past two years. Several new mines have been opened nd numerous properties, after years of idleness, have been rehabilitated nd are in a fair way to once more become bullion-producers. Some of ne propositions inaugurated prior to our last report have since been laced on a paying basis, and at least one prominent mine then operat- ng with small success has developed into a large and profitable enterprise. he deepest operating mine has a vertical depth of 2,150′, and others ill soon be as deep or deeper. One very commendable change has been ade in the sinking of new shafts. Until recently all the deep shafts n the great mines have been sunk in the veins, and it has been the eneral experience that when these fissures were not filled with solid uartz, great expense always attended the maintenance of these shafts, y reason of the heavy swelling ground, which continually displaced nd crushed timbers. The most recent practice is to sink large working afts in either the foot-wall or the hanging-wall, at some distance from ne vein; some of these are inclined and are sunk at a uniform angle, pproximating that of the vein; others are vertical in the hanging-wall. ne enterprise is sinking a vertical three-compartment shaft, which is ot expected to reach the vein in less than 1,750′ from the surface. nother large new shaft is now down over 1,000′.

Of all the prominent operations in progress within the past two years but two have suspended, while in their stead a score of new enterprises have been started. The county has other mineral resources than gold but these are less important. The construction of a narrow-gauge (24″) railroad from a point midway between Carbondale and Ione to Amador City, has been commenced. Over two miles of the grading has been completed at the valley end of it; work has been suspended for some months, but it is expected to be resumed.

*Acme* (*Robinson*) *Mine* (Quartz).—It is 3 miles N. of Volcano, near the Oleta stage road. After years of idleness active operations were resumed in the summer of 1895. The shaft is nearly vertical and 300′ deep. It was said the volume of water encountered in the old workings exceeded the capacity of the pumping-machinery. No other cause for shutting down was learned. A 10-stamp mill forms part of the surface plant. Ten men are employed. Acme Mining Co., owner.

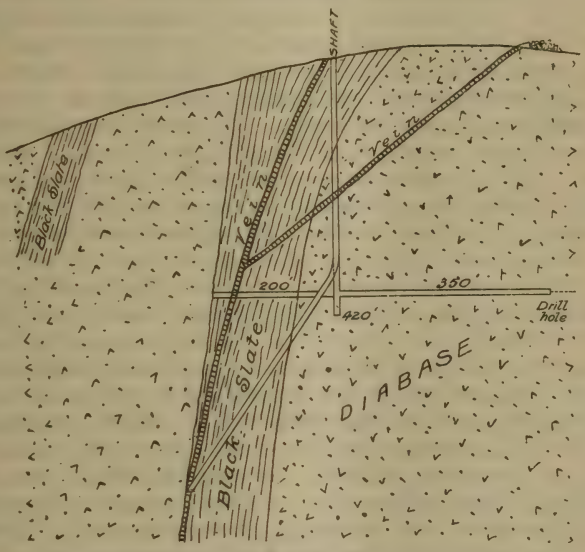
*Albany Mine* (Quartz).—See New Albany Consolidated.

*Allison Mine* (Quartz).—See Tripp.

*Allison Mine* (Quartz).—It is situated 1½ miles N.W. of Plymouth. The vein is from 2′ to 4′ wide, and carries marcasite and mispickel with gold. The developments consist of two shafts 30′ and 70′, respectively; the former is a double-compartment 5′x 9′ in the clear, and is substantially timbered and provided with a good hoisting-plant. A 3′ Huntington mill has been used to crush the quartz, but did not give satisfactory results, owing to the extreme hardness of the quartz. The vein occurs in brecciated diabase. Albert Allison, of Plymouth, owner.

*Alma Mine* (Quartz).—See our XIIth Report, p. 70. It is situated ¼ mile W. of Jackson, at 1,265′ elevation. In 1893 a three-compartment vertical shaft was commenced and sunk 420′. At 400′ a cross-cut was run west in the foot-wall for the purpose of intersecting a vein, the croppings of which appear upon the surface 350′ W. of the shaft. In July, 1895, the cross-cut had reached a point 300′ W. of the shaft, but no *large* vein had been encountered in shaft or cross-cut, either in the form of quartz or fissure. A diamond drill was then employed to prospect 100′ or more beyond the face of the cross-cut. The geology of the Alma is very interesting, and the history of its development exemplifies in a marked manner the necessity of careful investigation of geological conditions before determining upon a plan of development. The hill upon which the Alma is located consists chiefly of granular diabase through which runs a zone of black slate about 200′ in width. The shaft was started nearly in the center of the black slate strip, continuing in it to a depth of 270′, where it enters the west diabase and continues in it to the bottom of the vertical portion. Quartz croppings appear 350′ W. of the shaft, and were mistaken for a lode 100′ wide, whereas they are those of a vein a few inches in thickness lying in broken fragments on the surface of the ground, the hanging-wall diabase having been almost entirely denuded to within 350′ of the shaft where the vein dips 35° E. into the diabase. A small vein, 3″ or 4″ in thickness, inclosed in diabase, crosses the shaft about 300′ from the surface, which is probably the downward continuation of the vein exposed on the croppings. In an open cut, a short distance south of the shaft a gouge seam 12″ thick is exposed in the black slate. The same fissure may be observed in the bed of Jackson Creek. The strike of this fissure carries it a few feet east of the collar of the Alma shaft, which fact was

t noticed at the time the shaft was commenced. Failing to find a in in the west country, a cross-cut was run into the hanging-wall m the 400′ station; it passed a few feet through diabase and then tered the black slate, which is about 140′ wide on this level. The in, containing low-grade quartz, was passed through in the slate belt, e cross-cut being continued to the hanging-wall diabase. It was then termined to sink an inclined shaft, at an angle of 61° 30′, starting m the 350′ level of the vertical shaft. A curve was cut having a dius of 52′, and the shaft continued to 375′ on the incline, which point as reached about August 1, 1896. The shaft encountered the hang- g-wall diabase at that depth, and sinking on the contact is in ogress. In some respects the geology of the Alma is quite similar to




CROSS SECTION - ALMA MINE, JACKSON.

at of the Kennedy. Twenty men are employed. Alma Gold Mining ., of San Francisco, owner; John B. Francis, of Jackson, superin- ndent.

*Alpine Mine* (Quartz).—It is situated in the town of Plymouth, and rth of the old Empire. It has been idle for many years until the ring of 1895, when some work was done under bond, and about 40 ns of rock mined and milled. The shaft is 700′ deep, but caved. ank of California, San Francisco, owner.

*Amador Consolidated* (*Eureka and Badger*) *Mine* (Quartz).—See our th Report, pp. 72 and 102. It is situated in the southern suburbs of ie town of Sutter Creek. Idle for years. Hetty Green, of New York, wner.

*Amador Gold Mine* (Quartz).—See Jackson Gold Fields (Limited).

*Amador Queen Mine No. 1* (Quartz).—See Jackson Gold Fields Limited).

*Amador Reduction Works* (Chlorination).—See our VIIIth Report, p. 96. hey are on an eminence N. of the town of Sutter Creek. The plant

consists of one reverberatory furnace and a series of leaching and pre cipitation vats of the ordinary type. The works have a capacity of 13 tons monthly, and are run on custom ores. Five men are employed Barney & Voorheis, of Sutter Creek, owners; Hon. E. C. Voorhei superintendent.

*American Flat Mine* (Drift).—It is ½ mile S.W. of Oleta. A small forc of men were at work in the summer of 1895. George Beard, of Oleta superintendent.

*Anita Mine* (Quartz).—It is ½ mile S.W. of Jackson. In early time Mexicans took a large amount of gold from surface workings. Som years ago an inclined shaft was sunk 65′, and at 45′ from the surface drift and cross-cut were run. In these workings the vein is found strik ing N. 20° W; a branch makes into the foot-wall in a sweeping curve t the N.W. and W. A reorganized company commenced a new shaft 5( N. and W. of the old workings, and in July, 1895, it had reached depth of 190′, from which point a level was run E. 125′, where a 20″ vei was cut. The branch found in the drift north from the old incline wa also encountered in the new cross-cut. The main vein dips 43° E., an is entirely in diabase, which, near the vein, is altered to chloritic an talcose schist. The new shaft has an inclination of 63°, and was starte in black slate, in which it continued to a depth in 125′, when it encour tered the diabase. A belt of the black Mariposa slates lies some distanc east of this mine, being separated from the slates at the shaft by a be of diabase. At contact of slate and diabase in the shaft, a fissure cor taining irregular bunches of quartz and calcite with iron and copp sulphurets was found. The quartz has the appearance of having bee subjected to some secondary leaching process, presenting a peculiar ce lular structure, due perhaps to the removal of a portion of the calcit After reaching the vein in the cross-cut as above described, it wa determined to sink another inclined shaft east of the second shaft, o the foot-wall, at an angle of 63°. In August, 1896, it was 480′ dee No cross-cutting has as yet been done. Fifteen men are employed. Anit Gold Mining Co., owner; P. Reichling, of Jackson, superintendent.

*Argonaut Mine* (Quartz).—See our XIIth Report, p. 71. It is 1 mi N.W. of Jackson, joining the Kennedy on the south. The incline (63°) shaft, which was commenced in 1893, had reached a depth of 1,35 early in August, 1896. The vein crossed the shaft about 300′ from th surface, dipping 40° E. At 1,050′ quartz was again found in the hangin wall side of the shaft. The bottom of the shaft is in slate, with an crevice, containing foliated slate and some quartz. The mine equipped with a very substantial hoisting-plant, run by means of hem rope transmission from a water-wheel placed in a pit 30′ below. Th winding reels are placed 250′ from and about 60′ below the collar of th shaft, so that they are 297′ distant from the sheaves on the gallo frame, which rests on bedrock and is securely fastened by anchor bolt the sill timbers are also weighted with tons of railroad iron and massi blocks of stone. Twenty men are employed. Argonaut Mining Co., San Francisco, owner; W. F. Detert, of Jackson, superintendent.

*Arroyo Seco* (*Lambing*) *Mine* (Placer).—Fully described in our VIt Report, p. 23, and VIIIth Report, pp. 97–104. It is 3 miles N. of Ion A small quantity of water was being used through a 6″ pipe and 2½ nozzle under a pressure of 90′. The bank of gravel is about 8′ in dept

nd is quite hard. The sluice grade is very light, and dump poor. our men are employed. Frank Frates, of Ione, superintendent.

*Astoria Mine* (Quartz).—It is 4 miles S. of Jackson. See New Albany onsolidated.

*Badger Mine* (Quartz).—See Amador Consolidated.

*Bay State Mine* (Quartz).—It is 4 miles N. of Plymouth. See our IIth and XIIth Reports, pp. 146 and 71. In July, 1895, the shaft had eached a depth of 640′. Three shoots of ore had been partially devel-ped. The average progress in sinking the double-compartment shaft, ½′x 9′ in the clear, in the hard, black slate of the foot-wall, has been 0′ per month with hand drilling. A well-constructed 10-stamp mill as been built, and is run continuously. Nineteen men are employed. ay State Mining and Development Co., owners; W. T. Jones, of lymouth, superintendent.

*Belding Mine* (Quartz).—See Contention.

*Bellwether Mine* (Quartz).—See our Xth and XIth Reports, pp. 104 nd 140. It is ½ mile N.E. of Jackson, at 1,400′ elevation. In years ast a large amount of development has been done, including five shafts nging from a few feet to 180′ in depth and several hundred feet of nnels. A new 5′x 14′ three-compartment incline (62°) is now being nk, and had reached a depth of 100′ in August, 1896. Fourteen men e employed. Bellwether Mining Co., of Chicago, owner; D. H. Duncan-n, of Jackson, superintendent.

*Belmont* (*Sutter Creek*) *Mine* (Quartz).—See our VIIIth and XIth eports, pp. 73 and 143. It is ½ mile N. of the town of Sutter Creek. ismantled and idle.

*Bernardis Mine* (Quartz).—It is ½ mile E. of Sutter Creek, and has een opened since the publication of our XIIth Report. It is on what locally termed the East Lode. The workings are in amphibolite schist ltered diabase), through which is a reticulated mass of veins of vari-s widths, and bunches of quartz. Several pay-shoots are exposed, and e separated by altered diabase. A 3-stamp mill crushes 10 tons rock daily. The gold is coarse, and is mostly amalgamated inside e battery. Five men are employed. George Allen, of Sutter Creek, wner; James Bernardis, lessee.

*Black Hill* (Quartz).—See Loyal.

*Bunker Hill Mine* (Quartz).—See South Mayflower.

*Burner Reduction Works* (Cyanide).—They were built for the express rpose of treating the large accumulation of tailings from the Amador eduction Works, after several experiments had been made in the vats the same. Some of these tests, it is said by the manager, were tirely satisfactory, but others not so. On this insufficient test a anide plant, consisting of twenty-four leaching-tanks, and all the cessory arrangements, was built at a cost of about $8,000. After a ries of careful operations, carried on over a period of several months, e works were closed; presumably not a success. E. M. Burner & Co., Sutter Creek, owners.

*Central Eureka* (*Summit*) *Mine* (Quartz).—See our Xth, XIth, and IIth Reports, pp. 104, 144, and 79. It is ¼ mile S. of Sutter Creek. fter having laid idle for many years, the mine was bonded, a company ganized, and work commenced in the fall of 1895. The old develop-ents consist of three shafts, 75′, 500′, and 700′ deep, respectively, the st being the south shaft. A water-power hoist was placed on this

shaft early in 1896, and it was said to be the intention to sink 200 deeper, and then drift south, to connect with the 900′ level of the South Eureka Mine. This company also owns an east vein about 100′ E. of the Central Eureka, which will be known as the East Central Eureka, but it will be worked in connection with the Central Eureka. A water power air-compressor, 12″x 30″, has been installed to furnish power for the pumps. Twelve men are employed. John Tregloan, of Alameda, owner; Central Eureka Mining Co., holders of bond; W. R. Thomas, of Sutter Creek, superintendent.

*Colorado Mine* (Quartz).—It is a prospect 2½ miles E. of Volcano. W. Q. Mason, of Volcano, owner.

*Contention* (*Belding*) *Mine* (Quartz).—It is 2½ miles N.W. of West Point, Calaveras County, and is an old mine being reopened. Thomas Severns, of West Point, owner.

*Clinton Consolidated Mine* (Quartz).—See Union Consolidated.

*Clough Mine* (Quartz).—See Reward.

*Crown Point Mine* (Quartz).—See our XIIth Report, p. 92. It is miles N.W. of West Point, Calaveras County. Formerly a large producer, but idle for several years past. Crown Point Mining Co., of Oakland, owner.

*Dane & Mitchell Mine* (Quartz).—It is 1 mile S.E. of Pine Grove. In litigation, and idle.

*Downs Mine* (Quartz).—See our VIth Report, p. 20. It is 2 miles N. of Volcano. Idle and dismantled. R. C. Downs, of Sutter Creek, owner.

*Doyle Mine* (Quartz).—See our Xth Report, p. 107. It is 2 miles S. of Jackson. William Doyle, of Jackson, owner.

*Dry Creek Mine* (Placer).—It is 5 miles N. of Volcano, and is worked by ground-sluicing. Five men are employed. Reale, Bell & Hadley, of Jackson, owners; George Hadley, of Volcano, superintendent.

*Easton Mine* (Quartz).—It is 2½ miles N.E. of Plymouth, and is a new prospect. On July 1, 1895, the inclined shaft had been sunk 60′ on the vein, which was 1′ wide at the surface, but had widened to 6′ of solid quartz at the bottom; it carries about 2% of sulphurets. Both walls are well defined, and the inclosing country rock is altered diabase. George Easton, of Plymouth, owner.

*Elephantine Mine* (Quartz).—It is 3½ miles S. of Jackson. See New Albany Consolidated.

*Empire Mine* (Quartz).—See Plymouth Consolidated.

*Eureka Mine* (Quartz).—See Amador Consolidated.

*Evans* (*Meek*) *Mine* (Quartz).—It is a patented claim, ¼ mile S. of Jackson, adjoining the Zeila. It has only superficial development. Mrs. Ellis Evans, of Jackson, owner.

*Farrall Mine* (Quartz).—It is on the Mokelumne River, 4 miles S. of Jackson, and has a 5-stamp mill. Idle in July, 1895. Nathan Rosenburg et al., of Jackson, owners.

*Fifty-four Flat Mine* (Placer).—It is 5 miles N.W. of Volcano. Idle. Fifty-four Flat Mining Co., owner; Dr. Nichols, of Sutter Creek, president.

*Focus Mine* (Quartz).—It is on Sutter Creek, 2 miles W. of Volcano, and is a new enterprise. A 10-stamp mill was erected in July, 189[illegible]. Ten men are employed. H. M. Wolfe, of Volcano, superintendent.

*Forty-nine Flat Mine* (Drift).—It is 4 miles N. of Volcano. It is opened by a tunnel 600′ in length, and has numerous lateral drifts

The gravel is lightly cemented, and does not wash freely in sluices. The owners contemplate putting in machinery to disintegrate the gravel. Six men are employed. A. L. Reale et al., of Jackson, owners.

*Fremont Mine* (Quartz).—It is 1½ miles N. of Amador City, and forms part of the Gover property.

*Gold Mountain* (*Quartz Mountain*) *Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 75, 145, and 72. After a brief period of activity in 1893, it was again idle in 1895. Gold Mountain Mining Co., of 325 Montgomery Street, San Francisco, owner.

*Good Hope Mine* (Quartz).—It is in Jackson, and has recently been reopened. The shaft, an 80° incline, was 125′ deep in August, 1896. Hoisting is done with a horse-whim. About half an inch of water is raised with a small jackhead pump. The shaft is sunk on the ore channel, which contains a foot or more of gold-bearing quartz, and 4′ or 5′ of foliated slate, including quartz seams. Eight men are employed. Good Hope Mining Co., of Jackson, owner; Charles Peters, of Jackson, superintendent.

*Gover Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 53, 75, 146, and 72. It is 2 miles N. of Amador City. Operations were suspended during a part of 1894–95, but were resumed in the latter part of 1895, under the direction of Col. Isaac Trumbo. It is said that a new 60-stamp water-power mill will soon be built. Forty-two men are employed. C. E. Purrington, of Amador City, superintendent.

*Gracey Mill.*—It is situated at Pioneer, 5 miles E. of Volcano, and consists of a roller mill similar to the Chile mill. It is run on custom rock. Charles Gracey, of Pioneer, owner.

*Hardenburg Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 68–106, 139, and 74. It is 3½ miles S. of Jackson. After considerable exploration in 1893–94, and the discovery of gold-bearing rock on the 1,000′ level, operations were suspended in the winter of 1893–94, the prospect evidently being deemed too small to warrant further exploration. Hayward & Lane, of San Francisco, lessees.

*Harding Mine* (Quartz).—See Madrona.

*Hazard Mine* (Quartz).—See Treasure.

*Hollywood Mine* (Quartz).—It is 3½ miles S. of Jackson. See New Albany Consolidated.

*Irma Mine* (Quartz).—It is at Pioneer, 5 miles E. of Volcano. The vein occurs in grano-diorite, the quartz containing 10% sulphurets, chiefly pyrrhotite. The shaft is 193′ deep. Idle and dismantled. L. Passinelli, of Volcano, owner.

*Ivanhoe Mine* (Quartz).—It is 2½ miles N.E. of Plymouth. The mine has two shafts, 100′ and 120′, respectively. The influx of water into the deeper shaft was so great that heavier pumping machinery became a necessity. The owners not wishing to make this outlay, have since worked the upper portion of the mine, which consists of decayed amphibolite schist and quartz, containing gold. The mine has a 5-stamp mill, which is usually run during the daytime and occasionally at night. Seven men are employed. S. C. Wheeler, of Plymouth, owner.

*Jackson Gate* (*Massa*) *Mine* (Quartz).—It is 1 mile N.W. of Jackson. The croppings are very prominent and massive. Some time ago a tunnel was run 100′ or more to cut the vein. In the fall of 1895 an inclined shaft was commenced, which, in August, 1896, had reached a

depth of 400′, and considerable cross-cutting and drifting had beer done. The characteristic feature of this mine and the Bellwether, whicl joins it on the south, is the broad zone of ankerite and mariposite whicl forms the bold outcrop. In this respect these mines bear a marke resemblance to those in Tuolumne County, near Quartz Mountain an Golden Rule Hill. Fourteen men are employed. Jackson Gate Minin Co., of San Francisco, owner; John B. Francis, of Jackson, superin tendent.

*Jackson Gold Fields Co.* (Limited).—This property comprises th *Amador Gold* and *Amador Queen* mines, 1¼ and 2 miles S. of Jackson respectively. See our VIIIth, Xth, and XIIth Reports, pp. 88, 102, an 71. A new incline was commenced on the Amador Queen in July, 1895 which had reached a depth of 300′ in August, 1896. The manager state that it was the intention to crush the rock from this mine in the mil built for the Amador Gold Mine. Six men are employed. Jackso Gold Fields Co. (Limited), of London, owner; James E. Dye, o Jackson, general manager.

*Kate Gray Mine* (Quartz).—A prospect 2½ miles E. of Volcano. W. Q Mason, of Volcano, owner.

*Kelly Mine* (Quartz).—It is at Pioneer, 5 miles E. of Volcano. I has a shaft 90′ deep. Frank Kelly, of Volcano, owner.

*Kelly Mine* (Quartz).—See our Xth Report, p. 108. Idle. Henr Emerson, of Jackson, owner.

*Kennedy Mine* (Quartz).—See our VIIIth, XIth, and XIIth Report pp. 66, 70, 103, 141, and 74. It is 1 mile from Jackson. Since ou previous report, the south shaft has been sunk 200′, making it 1,95 vertically below the collar of the shaft, and nearly 2,500′ on the inclin below the croppings. The north shaft has been sunk 400′, giving vertical depth of 2,150′, with a 50′ sump. The mine is operated steadily The Gates canvas plant, operating on tailings from the Kennedy mil has been reconstructed since 1894. It embraces no new essential fea tures, however. One hundred and five men are employed. Kenned Mining and Milling Co., of San Francisco, owner; J. F. Parks, c Jackson, superintendent.

*Keystone Mine* (Quartz).—See our VIth (Part II), VIIIth, XIth, an XIIth Reports, pp. 16, 63, 145, and 77. It is in Amador City. Con cerning this mine there is nothing new that is noteworthy. The sha is the same depth as recorded in our last report, viz., 1,400′. During th night of January 2, 1895, the 40-stamp mill, which had been in con stant operation for fifteen years, was destroyed by fire. It was replace by a back-knee frame battery of 40 stamps and every modern con venience, including ten Woodbury concentrators and one 5′ Huntingto mill, etc. All troughs, lights, etc., are suspended on iron rods, and th view in front of the battery is unobstructed. The mill was in fu operation the forty-ninth day after the fire; a remarkably short time i which to make plans, secure machinery, and construct so large a mil Ninety men are employed. Keystone Mining Co., of San Francisc owner; E. T. Hale, of Amador City, superintendent.

*Lambing Mine* (Placer).—See Arroyo Seco.

*Little Amador Mine* (Quartz).—It is in the town of Amador Cit Since our last report some prospecting work has been done, and a Griffi mill erected. It is now idle, but the reason for suspension was n

tated. East Mayflower Gold Co., owner; S. H. Emmens, of Amador ity, superintendent.

*Littlefield Mine* (Quartz).—It is 4 miles S. of Jackson. See New lbany Consolidated.

*Lincoln, North Lincoln, and South Lincoln Mines* (Quartz).—See our IIIth, Xth, and XIIth Reports, pp. 73, 72–100, and 78. They are ½ ile N. of Sutter Creek. Idle for years. T. J. Clavering et al., of San rancisco, owners.

*Loyal* (*Loyal Lead, Black Hill*) *Mine* (Quartz).—See our VIIIth Reort, p. 51. It is 1 mile E. of Drytown, and adjoins the Gover on the ast. Idle. A. L. Wayne et al., of San Francisco, owners.

*Lucille* (*New London*) *Mine* (Quartz).—See our VIIIth, Xth, and IIth Reports, pp. 49, 117, and 78. It is in the southern suburbs of lymouth. An inclined shaft was sunk on the vein years ago to the epth of 1,300′. After a long period of idleness, English capital became nterested. In the fall of 1894 a new hoist and a fine 40-stamp mill ere erected, and the caved shaft reopened and retimbered to a depth of bout 400′. Operations were suddenly suspended for some financial eason. Lucille Mining Co., of England, owner; A. Harpending, of ashville, El Dorado County, manager.

*Madrona* (*Harding*) *Mine* (Quartz).—It is about 3 miles S.E. from olcano and ½ mile S. from Pioneer, and is one of the mines in the West oint granite belt. The developments are on a fissure of varying width, nd though only a prospect, the owners had 400 tons of quartz on the ump in the summer of 1895, which was to be sent to a custom mill at ioneer. Four men are employed. Griesbach & Mason, of Volcano, wners.

*Mahoney and South Mahoney Mines* (Quartz).—See our VIIIth, Xth, nd XIIth Reports, pp. 73, 72, and 78. They are ½ mile N. of the town of utter Creek, and were purchased in 1894 by the Wildman Company, iter having been idle some years. The Mahoney shaft is 1,000′ deep, nd a drift run south has made connection with the Wildman workings the 600′ level of the latter mine. The Mahoney Mine has been ntirely rehabilitated, retimbered, refitted, and rearranged. The 40 tamps, with 16 Frue vanners, have been running for some months ast. The stamps weigh 850 lbs., and are dropped 7″, 96 times per inute. A 20-mesh (No. 6) screen is used; the height of discharge 6″, which is kept as nearly uniform as possible by the use of uck-blocks, which are removed from beneath the screen as the dies ear down. The capacity per stamp is 3¾ tons in twenty-four hours. he front of the mortar is closed in the usual manner by a wooden frame ecured by driving iron wedges at the sides. The screens are tacked to a parate, smaller frame, which is secured to the front side of the rge frame, resting in flat iron chairs or hooks at the bottom, and edged at the top. This is found to be a convenient way of getting at ie inside plates without removing the heavy frame, and also prevents nd and fragments of broken quartz from falling out on the plates, ould it be necessary to open the battery temporarily. The inside ont copper plate is fastened to the base of the large frame. The outde (apron) plates are 4′ wide for a distance of 6′, where they taper to . In this distance there are four drops of 2″ each, dividing the apron to four plates, each 18″x 4′. At the lower end of the apron-plate is a ercury trap, 10″ deep, extending the full width of the plates. It is 2″

wide, the lower edge being 2″ lower than the upper. In this slot, 3′x 2′, is placed a dividing-board ¾″ thick and 36″ long, which reaches to within 1″ of the bottom of the slot. The pulp from the apron-plate drops into the slot, passes underneath the division and, rising on the lower side, flows over the edge of the trap on to the sluice-plate, which also is provided with 2″ drops and has a mercury trap similar to that described. The sluice-plates are divided into two sections, each 18″ wide. A second sluice-plate, without drops, is placed below the first, being also double. At its lower end these plates are merged into a single one contracted to 12″ in width, having a trap at its lower end, from which the pulp passes to the vanners. It may be called one of California's model mills. Sixty-four men are employed. Wildman Gold Mining Co., owner; John Ross, Jr., of Sutter Creek, superintendent.

*Mammoth Mine* (Quartz).—It is a prospect, 1½ miles N. of Plymouth Idle, and ownership in dispute.

*Mammoth Mine* (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 21, 93, 67–108, and 78. Idle. W. A. Nevills, of Jamestown, Tuolumne County, owner.

*Markley Mine* (Quartz).—It is 5 miles N. of Volcano, and in early days was a bullion-producer. See U. S. Mineral Statistics West of Rocky Mountains: 1870–71–72, pp. 37, 89, and 44. Work will shortly be resumed.

*Massa Mine* (Quartz).—See Jackson Gate.

*Mayflower Mine* (Quartz).—See our XIth report, p. 78. It is ½ mile N. of Amador City. In operation in 1893; now idle. It is said that a new shaft and other improvements are in contemplation. The Amador Gold Mine (a corporation), owner; S. H. Emmens, of Amador City, superintendent.

*McIntyre Mine* (Quartz).—See our Xth Report, p. 115. It is ½ mile S.W. of Amador City. After a long period of idleness, it was reopened in the summer of 1895. John McIntyre et al., of Sutter Creek, owners.

*Mechanics Mine* (Quartz).—It is ½ mile E. of Sutter Creek. After several years of idleness, active operations were recommenced in the summer of 1895; a test run on 60 tons of quartz having yielded a satisfactory return in bullion. P. Fagan, of Sutter Creek, owner.

*Medean Mine* (Quartz).—It is ½ mile S. of Amador City, joining the South Spring Hill Mine on the east. A new incline had reached a depth of 300′ in July, 1895, and the quartz mined was being crushed in the South Spring Hill mill. Thirty-five men are employed. South Spring Hill Gold Mining Co., owner; John R. Tregloan, of Amador City, superintendent.

*Middle Bar Mine* (Quartz).—It is 4 miles S. of Jackson, near Middle Bar crossing of the Mokelumne River, and has a steam hoist. Idle. See New Albany Consolidated.

*Modoc Mine* (Quartz).—It is ¾ mile E. of Pioneer, midway between Volcano, Amador County, and West Point, Calaveras County. A cross-cut tunnel was being driven in August, 1895, to prospect the vein. J. Mace, of Volcano, owner.

*Moore Mine* (Quartz).—See our VIth (Part II),VIIIth, and XIIth Reports, pp. 20, 84, and 78. It is 1 mile S. of Jackson. Idle. W. A. Nevills, owner.

*New Albany Consolidated Mines* (Quartz).—See our XIIth Report, p. 78. They are on the Mother Lode, south of Jackson, and compri

he *Albany*, *Astoria*, *Elephantine*, *Hollywood*, *Littlefield*, *Middle Bar*, and *New Albany*. All idle. New Albany Consolidated Gold Mining and Milling Co., owner; Martin Jones, of San Francisco, agent.

*New London Mine* (Quartz).—See Lucille.

*New York Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 23, 140, and 78. It is 3 miles W. of Jackson. G. W. Anderson, of Jackson, owner.

*North Gover Mine* (Quartz).—It is 1 mile E. of Drytown, and adjoins the Gover. Reuben Ford et al., of Amador City, owners.

*North Star Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 71, 99, and 78. Idle. Hon. E. C. Voorheis, of Sutter Creek, owner.

*Oneida Mine* (Quartz).—See our VIIth, Xth, and XIIth Reports, pp. 79, 109, and 78. It is 2 miles N. of Jackson. After an idleness of many years the work of reopening this mine was commenced early in January, 1896. A vertical three-compartment shaft is being sunk in the hanging-wall country rock, which, in August, 1896, was 340′ in depth. The plans for new gallows-frame and powerful hoisting machinery have been made, and the permanent plant is soon to be installed. Power drills were used for a time in this shaft, but they have been discontinued. Twenty-six men are employed. Ross E. Browne, of San Francisco, manager.

*Pacific Mine* (Quartz).—See Plymouth Consolidated.

*Philadelphia* (*Richmond*) *Mine* (Quartz).—See our XIIth Report, p. 78. It is 4 miles N. of Plymouth, and has been partly developed by an open cut 250′ long, 120′ high at the face, and from 20′ to 80′ wide. Near the center of this exposure is a large quartz vein of varying width. Other, though smaller, veins occur erratically in the slates on either side of the central vein. A double-compartment incline shaft is being sunk, and in August, 1896, was 115′ deep. A 15-stamp mill was erected in 1894. Operated under lease by the International Gold Syndicate (Limited), of London; J. J. Crawford, of Placerville, owner.

*Phœnix Reduction Works* (Chlorination).—See our VIIIth Report, p. 96. Located at Drytown. The plant consists of one reverberatory furnace and a series of leaching and precipitating vats. The capacity of the works is 90 tons per month. They are run on custom concentrates. Five men are employed. Voorheis & Barney, of Sutter Creek, owners; E. S. Barney, superintendent.

*Pioneer Mine* (Quartz).—See our XIIth Report, p. 78. It is in the southern suburbs of Plymouth. The work of development is now actively in progress. Eight men are employed. Pioneer Mining Co., owner; R. Robinson, of Plymouth, superintendent.

*Plymouth Con.* (*Empire and Pacific*) *Mines* (Quartz).—See our VIth, VIIIth, Xth, and XIth Reports, pp. 15, 42, 117, and 79. It is in Plymouth. Idle and dismantled. A. Hayward et al., owners.

*Posey Hill Mine* (Placer).—It is 5 miles N.E. of Volcano, and is worked in a small way. Two men are employed. George Hadley, of Volcano, owner.

*Quartz Mountain Mine* (Quartz).—See Gold Mountain.

*Rancheria Mine* (Placer).—It is 5 miles N.W. of Volcano, and is worked by ground-sluicing. Four men are employed. George Evans et al., of Volcano, owners.

*Red Cloud Mine* (Quartz).—It is 2½ miles N.E. of Plymouth, adjoining the Easton Mine on the north. An incline had reached a depth of 80′ early in July, 1895. Ten feet of quartz is exposed in an

open cut on the surface. The hoist is run by steam power. Eight mer are employed. Red Cloud Mining Co., of Stockton, owner; W. J Hussey, of Plymouth, superintendent.

*Reward (Clough) Mine* (Quartz).—It is on the Clough ranch, ¾ mil E. of Pine Grove. A vein has been opened by tunnels; a 5-stamp mill was in operation in July, 1895. Eight men are employed Reward Gold Mining Co., owner; W. C. Smith, of Pine Grove superintendent.

*Robinson Mine* (Quartz).—See Acme.

*Robinson Mine* (Quartz).—It is 6 miles S.E. of Oleta. It has a shaft 250′ deep, with an 8-stamp mill, which crushes 12 to 16 tons o quartz daily. Nine men are employed. Robinson & Co., of Oleta owners.

*Seaton Mine* (Quartz).—It is 1 mile E. of Drytown. It is reported that it will soon be started up. Idle. A. Hayward, of San Francisco owner.

*South Eureka Mine* (Quartz).—See our Xth, XIth, and XIIth Reports pp. 113, 144, and 79. It is ½ mile S. of Sutter Creek. The incline shaf had reached a depth of 1,200′ in July, 1896. A level was opened at 500 from the surface at the time the shaft was sunk, and some ore of lov grade found. A second level was established at 900′, and an ore-shoo of great promise discovered. The shaft is sunk in black slate on a fis sure filled with a crushed, foliated mass of slate and veinlets of quart and calcite. The ground is very heavy, and necessitates the employ ment of men constantly in retimbering, reinforcing the timbers, an relieving the ground, and is another evidence that it is not economy t sink deep shafts on the Mother Lode in the soft fissures. The expens of sinking in the walls is probably 30% to 50% greater, but the cost of keep ing a well-timbered shaft open which is sunk in solid rock is compara tively small. The greater portion of the claim is covered with andesit bowlders and cobbles, the capping of an ancient river channel, and ther was nothing on the surface to indicate the whereabouts of a vein. A survey was made north from the Kennedy Mine, taking the 1,650′ level a a basis for operations. The line was extended through the South Eurek ground on the surface; a second line was surveyed south from the Eurek Mine. These two lines were found to be approximately parallel and 100 apart on the surface of the South Eureka claim. A point was chose midway between the lines and the shaft commenced, with the resul above mentioned. On driving a cross-cut east on the 600′ level, a wate channel or reservoir was encountered, and so heavy was the pressur that the drill was thrown several feet by the force of the stream. Th flow was stopped by constructing a substantial bulkhead in the drift The upper portion of the mine is extremely wet, and water-tight cemented bulkheads were built in a number of places. This plan together with that of catching up water at stations on the upper levels prevents the great volume of water from reaching the bottom of th mine. On the 900′ level a cross-cut was run east to the contact of blac slate and diabase, and at this contact the vein of gold-bearing rock wa discovered. Along the hanging-wall side of the vein the chloritic and tal cose schists (altered diabase) is found to contain auriferous iron pyrites an free gold to the extent of making the schists a portion of the pay zon The drift has been run in the foot-wall most of the way, frequent cross cuts having been made into the vein, exposing a fine shoot of ore rangin

rom a few inches to 5′. Along the foot-wall side of the vein is a rich ›ay streak from 1″ to 10″ in width, heavily sulphuretted and high grade. ‹ 20-stamp mill was built in the summer of 1895, and a steam boiler ıas been placed in the hoist, to be used should the water-supply fail. The South Eureka Mine is an example of what may be accomplished by udicious investment of capital on the great gold belt that runs through his portion of the State. There are other places as promising, if not nore so, than was this prior to its development. Fifty-seven men are mployed. South Eureka Gold Mining and Milling Co., owner; J. F. Parks, of Jackson, superintendent.

*South Mahoney Mine* (Quartz).—See Mahoney.

*South Mayflower* (*Bunker Hill*) *Mine* (Quartz).—See our VIIIth, Xth, nd XIIth Reports, pp. 57, 75–114, and 79. It is in the northern uburbs of Amador City. Worked in 1895 by "tributers" in the south nd of the mine. With this exception no work was in progress. Idle n 1896. East Mayflower Gold Co., owner; S. H. Emmens, of Amador City, superintendent.

*South Spring Hill Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 80, 73–98, 145, and 79. In litigation and stopped by njunction. South Spring Hill Gold Mining Co., of Lemonston, Mass., ›wner; John R. Tregloan, of Amador City, superintendent.

*St. George Mine* (Quartz).—It is 1½ miles N. of Plymouth. Idle. Thomas George et al., of Plymouth, owners.

*St. Junian Mine* (Quartz).—It is a prospect, 4 miles S. of Jackson. Idle. St. Junian Gold Mining and Milling Co., owner; Hon. A. Cam-netti, of Jackson, manager.

*Stewart Mine* (Quartz).—It is a short distance below Big Bar Ridge, 4 miles S.E. of Jackson. Provided with a 3-stamp mill. Idle, and in itigation.

*Strong Mine* (Quartz).—It is a prospect, 1½ miles N. of Amador City. East Mayflower Gold Co., owner.

*Summit Mine* (Quartz).—See Central Eureka.

*Sutter Creek Mine* (Quartz).—See Belmont.

*Telegraph Hill Mine* (Drift).—It is near Rancheria Creek, 5 miles N.W. of Volcano. A tunnel has been driven on the channel 700′. Four men are employed. George Evans and M. Fitzgerald, of Volcano, ›wners.

*Tellurium Mine* (Quartz).—See our XIIth Report, p. 79. It is 1 mile N. of Pine Grove. Idle. N. G. Young, of Volcano, agent.

*Tierakoff Mine* (Quartz).—See our XIIth Report, p. 92. Idle. Crown Point Mining Co., of Oakland, owner.

*Treadwell Mine* (Quartz).—It is 7 miles E. of Sutter Creek, and is an ›ld prospect, being worked in 1895. There is a 6-stamp mill on the property. Nine men are employed. William Castle, of Volcano, superintendent.

*Treasure* (*Hazard*) *Mine* (Quartz).—It is 1½ miles N. of Amador City. Years ago a long tunnel was driven in on the vein from a point near the base of the hill, near Rancheria Creek, and an incline sunk a short distance on the hillside above the tunnel. After years of idleness a hoisting-plant was put in place, and sinking commenced in the summer of 1895. The shaft, sunk at contact of slate foot-wall and diabase hanging-wall, was 400′ deep in August, 1896, and at a point 375′ from the surface a drift is being driven south. Nine men are employed.

A. Hayward, of San Francisco, owner; Wales Palmer, of Amador City superintendent.

*Tripp Mine* (Quartz).—It is ¼ mile above Big Bar Ridge, 5 miles S.E. of Jackson. It was extensively opened in former years by a series of tunnels. The property includes the *Allison Mine*, which joins it. Both are now idle. A 10-stamp mill, built for the Tripp Mine, is running on quartz from the Garner Mine, on the opposite side of the Mokelumne River, in Calaveras County, and is included in the property. See Garner Consolidated, Calaveras County. Tripp & Lucas, owners; S. H. Lucas, of Jackson, superintendent.

*Union* (*Clinton*) *Consolidated Mine* (Quartz).—See our XIth and XIIth Reports, pp. 142 and 72. After a period of idleness, operations were resumed in the spring of 1896, and considerable prospecting work is now being done. D. Gutman et al., of San Francisco, owners.

*Valparaiso Mine* (Quartz).—It is a prospect, 4½ miles S. of Jackson. Joseph Poggi et al., of Jackson, owners.

*Wheeler Mine* (Drift).—It is 2½ miles S. of Pine Grove. It was worked under bond in 1894, but was idle in 1895. J. T. Wheeler, of Pine Grove, owner.

*Wildman Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 75, 101, 144, and 80. It is in the town of Sutter Creek and is worked in connection with the *Mahoney*. The shaft is 1,300 deep, on an inclination of 70°, and has two compartments, there being a small section partitioned off for pump and ladder-way. The shaft has been sunk in the fissure, and the ground is usually very heavy, often swelling and shifting, and causing a great amount of expense and trouble in keeping the timbers in place and the shaft in line. A large portion of the shaft timbers has been reinforced repeatedly. Connection has been established on the 600′ level with the 800′ or corresponding level of the Mahoney. Since the advent of the new management several ore-bodies have been opened on the 500′, 600′, 1,200′, and 1,300′ levels and sufficient pay-rock is now in sight to keep the 30-stamp mill in operation many months. The pay-shoots occur in chloritic and talcose schists (altered diabase) lying between walls of black slate. These schists are silicified and impregnated with auriferous iron sulphurets and free gold. Masses and veins of quartz also occur throughout the mineralized zone, the quartz also being gold-bearing. In the lower levels of the mine no lenses or masses of quartz are found at the contact of slate and diabase, which may be considered distinctively contact veins, as in the South Eureka or Kennedy mines. In places the diabase, chloritic schist, etc., have been proven, by cross-cuts, to be 100 wide, and from borings made by diamond drills it appears to become wider southward. The following figures, showing approximately the cost at which a large quartz mine may be operated in California under favorable conditions, are furnished by Mr. John Ross, Jr.:

*Cost of Mining One Ton of Ore at the Wildman Mine during the Year ending October 1, 189*

| | |
|---|---|
| Timbers | $0 16.0 |
| Spiling | 04.8 |
| Lumber | 02.2 |
| Charcoal | 01.7 |
| Candles | 02.1 |
| Powder | 04.8 |
| Fuse | 01.1 |
| Caps | 00.2 |
| Water for power | 09.9 |
| Freight | 02.9 |

| | |
|---|---|
| Iron | $0 01.1 |
| Steel | 00.7 |
| Hardware | 02.4 |
| Oil | 00.8 |
| Grease and tar | 00.2 |
| Coal | 00.2 |
| Miscellaneous | 03.4 |
| Surveying | 01.3 |
| Power drill machinery | 03.2 |
| Wire rope | 00.7 |
| Half of insurance and taxes | 01.1 |
| Half of office and assay supplies | 00.5 |
| Pump repairs | 00.7 |
| Superintendence and labor | 1 40.1 |
| Total | $2 02.1 |

The above includes all repairs, equipment, diamond-drill development, and general development work of the mine, cost of operating rock-breaker, and delivering ore in the bin of the mill.

*Cost of Milling One Ton of Ore in 30-Stamp Water-Power Mill (capacity 100 tons per day) for a Period of One Year.*

| | |
|---|---|
| Shoes | $0 01.9 |
| Dies | 01.5 |
| Screens | 00.4 |
| Quicksilver | 00.6 |
| Wood | 00.3 |
| Hardware | 00.4 |
| Belting | 01.1 |
| Water for power | 09.4 |
| Freight, Lumber, Oil, Grease and tar | 00.2 |
| Cyanide | 00.3 |
| Miscellaneous | 00.6 |
| Half assay supplies | 00.2 |
| Half office supplies | 00.2 |
| Expressage on bullion | 00.5 |
| Hauling sulphurets | 01.6 |
| Half insurance and taxes | 01.1 |
| Superintendence and labor | 16.1 |
| Total | $0 36.4 |

This includes all repairs and equipment. Total cost of mining and milling one ton of quartz, $2 38.5. Sixty-two men are employed. Wildman Gold Mining Co., owner; John Ross, Jr., of Sutter Creek, superintendent.

*Wolverine Mine* (Quartz).—It is situated at Sutter Creek, between the Eureka and Wildman. It has no machinery, and has been idle for years.

*Zeila Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 68–85, 68–104, 139, and 80. It is in the town of Jackson. The shaft is 1,160′ deep, the lowest level being at 940′. Since our last report the mill plant has been supplied with new mortars, mortar-blocks, and battery-frame. The old mortars were in constant use for fifteen years, their period of usefulness having been greatly prolonged by the use of inside linings. The furnace of the chlorination works has also been rebuilt, and some necessary changes made about the hoisting works. The company has recently purchased 25 acres lying immediately east, and the sinking of a new vertical shaft in this area is under consideration. One hundred and ten men are employed. Zeila Mining Co., owner; W. F. Detert, of Jackson, superintendent.

*Zumwalt Mine* (Quartz).—It is ½ mile east of Pioneer. Idle, and in litigation. L. D. Wicks, of Volcano, owner.

## MILLS IN AMADOR COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in lbs. | Capacity per 24 hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Acme | | 10 | 950 | 20 | 5 | Hendy | | | | |
| Amador | | 60 | 850 | | 24 | Frue | | | | |
| Amador Queen | Water | 20 | 950 | 60 | | | | | | |
| Bay State | | 10 | 850 | 20 | 4 | Frue | | | | |
| Bernardis | | 3 | 900 | 9 | | | | | | |
| Clinton Consolidated | | 10 | 850 | | | | | | | |
| Farrall | | 5 | 850 | 12 | | | | | | |
| Focus | | 10 | 850 | | | | | | | |
| Gover | | 20 | 850 | 50 | 8 | Frue | | | | |
| Ivanhoe | Water | 5 | 950 | 12 | | | | | | No data. |
| Kennedy | | 40 | 850 | 100 | 24 | Frue | | | | |
| Keystone Consolidated * | | 40 | 950 | 90 | 10 | Woodbury | | | | 2,500 sq. ft. |
| Live Oak | Water | 2 | 850 | 5–6 | | | | | | |
| Loyal Lead | Water | 10 | 700 | 15 | | | | | | |
| Lucille | | 40 | 850 | | | | | | | |
| Mahoney and South Mahoney | | 40 | 850 | 140 | 4 | Frue | | | | |
| Mayflower | | 40 | 850 | | 14 | Frue | | | | |
| Nevills | Water | 10 | 750 | 25 | | | | | | |
| Philadelphia | Water | 10 | | | | | | | | |
| Pioneer | | 20 | 850 | | | | | | | |
| Reward | | 5 | 850 | 12 | 2 | | | | | |
| Robinson | | 8 | 700 | 12–16 | | | | | | |
| South Eureka | | 20 | 850 | | | | | | | |
| South Spring Hill | | 40 | 750 | 100 | 10<br>2<br>2 | Frue<br>Triumph<br>Woodbury | | | | |
| Stewart | | 3 | | | | | | | | |
| Sutter Creek | Water | 10 | 850 | 15–20 | | | | | | |
| Treadwell | | 6 | 800 | 10 | | | | | | |
| Tripp | | 10 | 850 | 25 | | | | | | |
| Tripp and Allison | | 10 | 850 | | | | | | | |
| Wildman | | 30 | 850 | 95 | 8<br>4 | Frue<br>Triumph | | | | |
| Zeila | | 40 | 800 | 140 | 16 | Frue | | | | |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN AMADOR COUNTY.

| Name of Mill or Mine. | Power. | Number | Character. | Diameter. | Capacity per 24 hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Allison | | 1 | Huntington | 3′ | | | | | | | |
| Gracey | | 1 | Roller quartz | | 12–16 | | | | | | |
| Keystone Consolidated | | 1 | Huntington | | | | | | | | |
| Little Amador | | 1 | Griffin | | 16 | 2 | Frue | | | | |

## CUSTOM WORKS IN AMADOR COUNTY.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Amador Reduction Works | | | | | | | | 1 | 4½ | | |
| Burner Reduction Works | | | (At Sutter Creek.) | | | | | | | 50 tons. | |
| Phœnix Reduction Works | | | | | | | | 1 | 3 | | |

## Butte County.

*Alki Mine* (Drift).—See Parry.

*Aurora Mine* (Drift).—See Princess.

*Bader Mine* (Drift).—See our XIIth Report, p. 80. It is 1½ miles E of Magalia, at 2,350′ elevation, and contains 110 acres. The course o the channel is N. 30° E. Since our last report the main tunnel has bee driven to 1,400′ in length, the channel crossed, and some breasting done The bedrock tunnel is being extended 130′ to reach the bottom of th channel through an upraise. This channel cuts through a quartz ledg striking N.W. and dipping N.E. in slate and porphyry, from 2½′ to 14 wide. Four men are employed. G. B. Mowry, of Magalia, owner.

*Bangor Mine* (Drift).—See our XIth and XIIth Reports, pp. 164 an 80. It is 1 mile E. of Bangor, and comprises 2,400′ on the channel. F W. Johnson, of Marysville, owner.

*Banner Mine* (Quartz).—It is 5 miles N.E. from Oroville, at 550′ eleva tion, and comprises 6,000′ by 200′ of patented ground. There are thre veins, bearing N.W. with a nearly vertical dip, designated the *Amoskeag Big Banner*, and *Little Banner;* the two latter unite at a depth of 200′; th first, 700′ N., remains undeveloped. The foot-wall is slate, the hanging wall diabase. The main shaft is in the hanging-wall, 107′ from the vei in the lowest works. It is a double-compartment vertical shaft, 80 deep, and is being continued to 1,000′ depth; there are stations at ever 100′ down to the 600′ level, connecting with the vein; below the 60 level is a winze down to the 700′ level, but no drifting has been don on the vein below the 600′ level. The ore-supply comes from the working near the surface, and from the ore-shoot north of the shaft, which is 20 long. The principal stopes are between the 400′ and 600′ levels. Th greatest extent of drifting is 700′ north on the 300′ level, and 800′ nort on the 500′ level. The mine makes from 3 to 4 miner's inches of wate which is raised by two electric pumps, one at the 300′ and the other a the 600′ level. A cross-cut to the Amoskeag vein on the 300′ level is 70 long, and made use of as a reservoir. The pumps have a capacity of 13 gals. per minute. The power for the entire plant is electric, with steam as auxiliary. The main dynamo in the power-house is run by two 5 Pelton wheels under 48 lbs. pressure per square inch, and is 3 miles dis tant. The two air-compressors, mill, rock-breaker, two pumps, and saw mill are each run by a separate motor. There are also 60 electric light of 24 candle-power in and around the works. There are two compres sors, a Rand and a Burleigh, for 3 and 8 drills, respectively. The mill which is not being run while sinking the shaft, has 10 stamps of 85 lbs. weight, with frame for 10 additional; 14′ of aprons set on a 1¼′ grade per foot; two Hendy, two Triumph, and one Johnston concentra tor. The capacity of the mill is 2 tons to the stamp per day, using No. 35 brass wire screen, with 6″ drop and 92 drops per minute, wit 7½″ discharge. The mortars are supplied with front and back plates Adjacent to the mill is a large laboratory, melting and assay office Sawed timbers are used in the mine, brought from Magalia Ridge, 2 miles distant, at a cost of $14 per M; the lagging is brought fron Forbestown Ridge. Golden Banner Gold Mining Co. (Limited), owner George E. Evans, of Oroville, superintendent.

*Bessie Mine* (Quartz).—See Wild Yankee.

*Best Mine* (Drift).—See Napa and Solano Counties Mining Co.

*Bishop & Wells Mine* (Quartz).—It is 3½ miles W. of Merrimac, and comprises two claims. The 3′ vein strikes N. and S., and dips 45° W., between porphyry and granite walls. There is a tunnel 100′ long on the vein, giving 40′ of backs. A 5-stamp mill with 300-lb. stamps is driven by an 8′ hurdy wheel under 40′ pressure, taking water from Clear Creek through ½ mile of ditch. The mill crushes 3 tons per 12 hours. Idle. W. C. Bishop et al., of Merrimac, owners.

*Bluebird Mine* (Quartz).—It is 2½ miles N. of Inskip, at 3,850′ elevation. The vein strikes N.E. and dips N.W., and is from 3″ to 4″ wide, in a decomposed porphyritic rock. There is a 30′ shaft and several open cuts on the vein. The gold is obtained by washing the quartz in a pan. One man is at work. A. D. Lazelira, of Inskip, owner.

*Burgstrasser* (*Kickapoo*) *Mine* (Drift).—See our XIIth Report, p. 85. It is 6 miles W. from Strawberry Valley, Yuba County, at 3,500′ elevation, and comprises 100 acres. It was formerly worked as a hydraulic claim, the channel being from 200′ to 300′ across. There is a 300′ bedrock tunnel, with a 12′ upraise into the gravel, and a 300′ gangway. The gravel is removed 6′ high, but no breasting is being done, only prospecting. Three men are employed. Drake, Gronwaldt & Boyce, of Strawberry Valley, Yuba County, owners.

*Butte Creek Mine* (Quartz).—See our XIIth Report, p. 81. It is on Big Butte Creek, 1 mile E. of Nimshew. T. O. Carter, of Nimshew, owner.

*Butte King and Queen Mine* (Drift).—See our Xth and XIIth Reports, pp. 145 and 81. It is in Sec. 20, T. 25 N., R. 5 E., and comprises 2,150′ on the channel, by 100′ wide. Butte King and Butte Queen Consolidated Mining Co., owner; J. W. Woods, of Chaparral, superintendent.

*Buzzard Mine* (Quartz).—See Edna M.

*Cain's Mine* (Quartz).—It is ¼ mile S. of Inskip, at 4,250′ elevation. The vein runs E. and W., and dips N., in a slate formation. A tunnel is being driven on the vein. Two men are employed. — Cain, of Inskip, owner.

*Carlisle Mine* (Quartz).—It is on the South Fork of Feather River, 2½ miles S.E. from Forbestown. It comprises 640 acres, at 1,275′ elevation. The 9′ vein courses N.E., and dips about 50° N.W. There is an undeveloped parallel vein about 100′ to the N.E. The principal vein shows an ore-shoot pitching N.E., under the bed of the river, and carrying a heavy percentage of high-grade iron, copper, and lead sulphurets, with ribbon quartz. Near the north bank of the river a short cross-cut of 60′ intersects the vein, where a 70′ shaft has been sunk on it. About 30′ feet above, and a short distance N.E., is a second tunnel. The formation is syenitic, with slate and porphyry in close proximity on the east side. On Indian Ravine, near the N.E. end of the property, is another large vein, which has been opened with a short tunnel, yielding a good grade of quartz; while on the S.W. end of the property the *Big Betsy* vein crops out very prominently. A cross-cut, now 75′ long, is being driven on this part of the property to develop the vein. Water-power is available under high pressure on either side of the river. James Carlisle, of Forbestown, owner.

*Catskill Mine* (Drift).—See our XIIth Report, p. 82. It is in T. 25 N., R. 5 E., 1 mile N.W. from Bangor, at 750′ elevation, and comprises 800 acres. The channel has an E. and W. course, with 12′ of gravel on the bedrock, capped with 3′ of sand, above which is a 6′ layer of gravel.

The gravel is said to be worth $2 50 per cubic yard, and carries 33% of cobbles and bowlders, that are stored in the mine. The 4′ x 10′ double-compartment shaft is vertical and 210′ deep. The main gangway extends 900′ E. and 300′ W.; the breasts are carried from 8′ to 18′ high, 40′ wide, and are timbered with posts and caps; 300′ of the channel has been worked; 60 carloads, of ¾ ton each, are mined per day with 16 breasters. The pump, hoist, and arrastras are run by an 85 H.P. engine; the former is a 6″ jackhead; the two arrastras are 10′ wide, taking 4 tons to a charge, and 8 charges in twenty-four hours. The arrastras discharge through 400′ of sluices into the Rocky Honcut Creek. Ten inches of water is taken from the Forbestown ditch, at a cost of 10 cents per inch. Twenty-three men are employed. C. S. Barefoot, of Bangor, owner and superintendent.

*Cherokee Mine* (Hydraulic).—See Spring Valley Gold Mining Co.

*Church Mine* (Drift).—See Princess.

*City Garden Mine* (Drift).—It is in Oroville, at 175′ elevation, and comprises 10 acres on a former river channel running under the eastern part of the town, with a N. and S. course. A 6′ x 7′ shaft in the clear is 65′ deep; at 25′ gravel was struck, followed by 10′ of cement, then by 5′ of sand, then by cement, then by 5′ of sand, and then by cement to the bottom; it will require 45′ more to reach the bedrock gravel. Idle. G. Becker et al., of Davenport, Iowa, owners.

*Clarke Bros. Mine* (Quartz).—It is in the Concow District, 10 miles E. of Yankee Hill, at 2,300′ elevation; and adjoins the Pinkston Mine. A tunnel has been run 135′ on the vein, giving 65′ of backs. There is a 12′ steam-power arrastra, crushing 2 tons per twelve hours. Four men are employed. Clarke Bros., of Yankee Hill, owners.

*Contention Mine* (Drift).—It is ¾ mile S.W. from Lovelock, at 2,800′ elevation, and comprises 60 acres in Sec. 36, T. 23 N., R. 3 E. The work is on an old lava-capped channel, about 30′ wide, running E. and W. A main tunnel runs 190′ in bedrock, then 65′ across the channel, 30′ of which is in gravel 4′ deep, and thence 15′ down stream. About 50′ back from the cross tunnel an 18′ incline has been sunk. No water on the bedrock. The gravel is quartz and slate carrying coarse gold. Wash water is taken from Little Butte Creek, at the mouth of main tunnel. Idle. J. N. Smith, of Lovelock, owner.

*Crystal Hill Mine* (Quartz).—It is 3 miles N.W. of Enterprise, at 1,100′ elevation. The vein, about 18″ wide, courses E. and W., and dips vertically in granite. There is a tunnel 100′ long and an upraise to the surface. A 4-stamp water-power mill, with 750-lb. stamps, crushes 6 tons daily. Four men are employed. F. Bachman, of Enterprise, owner.

*Crystal Peak Mine* (Quartz).—It is 3 miles N. of Enterprise, at 1,100′ elevation, and comprises three claims. The 5′ vein courses E. and W., and dips 50° S. in granite. A tunnel has been run 150′ on the vein. There is a 2-stamp water-power mill, with 750-lb. stamps, crushing 3 tons in twenty-four hours. The quartz carries 0.5% of sulphurets, mostly iron. Three men are employed. A. T. Slater and Charles Alm, of Enterprise, owners.

*Defiance Mine* (Quartz).—See our XIIth Report, p. 82. It is 9 miles N. of Oroville, near Oregon City. A. Eckman, of Oroville, owner.

*Dog Hill Mine* (Drift).—See our XIIth Report, p. 82. It is 1½ miles W. of Chaparral, at 5,800′ elevation, and comprises 80 acres of ground.

The channel has a N.E. and S.W. course. A new tunnel is being driven 100′ lower than the two principal tunnels, and will have to be extended 600′ in slate bedrock to cut through the rimrock. The channel has 150′ of capping over it, and is about 200′ across. Two men are at work. — Hedges, of Inskip, owner.

*Edna M.* (*Buzzard*) *Mine* (Quartz).—See our XIIth Report, p. 82. It is 2½ miles W. from Inskip, at 3,850′ elevation. The vein or seam varies from 6″ to 1′ in width. The present workings are in a 400′ tunnel following the seam, which has produced a large amount of gold. There is an 8′ water-power arrastra, run with water taken from the Cherokee ditch. Two men are employed. F. G. Salisbury and E. Henderson, of Inskip, owners.

*Excelsior* (*Mammoth*) *Mine* (Quartz).—It is 4 miles N.W. from Inskip, at 3,925′ elevation. The vein strikes N. with a vertical dip, and a width of 3″ in slate. There is a shaft on the vein 40′ deep; when sunk to 100′ it will connect with a tunnel now about 240′ in length, and requiring to be extended 80′ more. A 4-stamp double-stem battery, with square shoes and dies, weighing 350 lbs., to be run by water-power, has been erected for prospecting purposes. The cam works between the two stems. Five men are employed. H. Riley, of Inskip, owner.

*Fitzpatrick Mine* (Quartz).—It is ¾ mile from Inskip, at 4,250′ elevation. The 4′ vein strikes N. and S., and dips 60° E. in a granite formation. A tunnel has been driven 495′ on the vein, giving 110′ of backs. Only assessment work is being done. J. Hodnalt, of Inskip, owner.

*Forty-nine Mine* (Quartz).—See New Oregon.

*Gold Bank Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 125, 162, and 83. It is ¼ mile N.E. from Forbestown, at 2,820′ elevation at the hoisting works, and 2,025′ at the lowest tunnel. Since our last Report a deep lower tunnel, 8′x 8′, has been driven to intersect the vein 500′ vertically below the mine works. This tunnel, driven with two machine drills abreast, at a cost of $10 per foot, crossed, 1,200′ from the mouth, a mineralized quartzite formation, which was taken for the vein and drifted on a couple of hundred feet, and an upraise made; later, the main tunnel was continued a distance of 400′, where for the first time water and small veinlets of quartz were encountered. The rock formation, with the exception of the quartzite dike, shows no appreciable change throughout the entire length of the work. As the upper workings show a gradual straightening of the vein, amounting to at least 7°, the vein proper may not be reached in the tuunel for some distance. The 40-stamp water-power mill is kept steadily running, showing an output of 4,300 tons per month, using a No. 7 slot-punched screen. A 4-drill Rand compressor has been erected below the big tunnel. Water power, 160 miner's inches, under 350′ pressure, is obtained from the Forbestown ditch. Over 1,200′ of 11″ air-pipe is used with a No. 4 Sturtevant exhaust fan. One hundred and five men are employed. H. P. Stow, of Forbestown, owner and superintendent.

*Golden Butterfly Syndicate's* (*Limited*) *Mine* (Drift).—It is in Morris Ravine, 4 miles N. of Oroville, at 300′ elevation. It is 3½ miles long and of varying width, and contains 1,220 acres. The channel has a N. and S. course, and a tunnel has been driven 700′ on a N.E. course and 120′ below the channel on an incline, from which an upraise has been started. Seventeen men are employed. Golden Butterfly Syndicate (Limited), owner; S. P. Moody, of Oroville, superintendent.

*Golden Feather Channel Co.'s (Limited) Mine* (Placer).—See our XIth and XII Reports, pp. 150 and 83. It is situated just above Oroville, at 190′ elevation. During the past season of six months 400′ of the river channel has been worked and 500′ stripped. The power for the "elevator" is derived from the Miocene ditch, through ¾ mile of 36" to 16" pipe into the claim. Two derricks with 53′ booms are used. A dynamo run by a 3′ Pelton wheel, furnishes 20 arc lights. Five elevators of an improved pattern were placed in position this spring, started up about August 1st, and are doing good work. Fifty men are employed. An English incorporated company, owner; George E. Evans, superintendent.

*Golden Fissure Mining Co.'s Mine* (Quartz).—It is 3½ miles W. of Enterprise, at 1,500′ elevation. The 4′ vein courses E. and W., and dips nearly vertically in granite. There is a 100′ tunnel on the vein. Two men are at work. G. H. Snow, of Forbestown, owner.

*Golden Summit Mine* (Quartz).—See our XIIth Report, p. 84. It is in Sec. 21, T. 25 N., R. 5 E., 18 miles E. of Powellton, on the county line, at 6,600′ elevation, and contains 320 acres of patented ground. The vein of 8′ average width, strikes N. 66° 30′ E., and dips nearly vertical between syenite and greenstone walls, which are exceedingly hard. A 250′ inclined shaft is tapped at 100′ depth by a drain tunnel 400′ long and has levels at every 100′; extending 400′ E. and W. on the first level and 300′ E. and 250′ W. on the second level. A covered track connects the mine and mill, which has 10 stamps of 800 lbs. weight, furnished with forged steel shoes and dies, and two Woodbury concentrators. The motive power is steam, and during the summer 20 men are employed chopping and hauling wood. In February last the boarding-house and supplies were burned, which retarded development some months on account of the deep snows. Thirty-six miners are employed. Goodall Perkins & Co., of San Francisco, owners; C. G. Kane, of Powellton, superintendent.

*Golden Summit Blue Gravel Mine* (Drift).—It is 7 miles E. of Inskip at 6,300′ elevation, and comprises 159 acres. The channel has a S.W. course. The main tunnel, which has just reached gravel, is 900′ in length, with a 19′ upraise in the end. The gravel carries quartz bowlders, and contains coarse gold. Four men are employed. Gregory & Co., of Inskip, owners.

*Golden Thread Mine* (Quartz).—See our XIIth Report, p. 84. It is 2½ miles N.W. from Inskip, at 3,550′ elevation. The small quartz veinlets have a N.E. trend, are in a decomposed rock and clay formation and are worked by cuts and tunnels. Two men are employed. Wm. Powers & Son, of Inskip, owners.

*Gregory Mine* (Quartz).—See our XIIth Report, p. 84. It is 9 miles E. of Chaparral, and on the same channel as the Butte King and Queen. J. B. Doyle, of Chaparral, owner.

*Grove Mine* (Drift).—It is ¾ mile from Bangor, and adjoins the Catskill on the same channel, at 800′ elevation. An incline, 125′ deep, reaches bedrock on a high point of ground, and a new one is being sunk in a low swale, which will greatly shorten the depth. Two men are at work. An incorporated company of Gridley, owner; Ed. Bloom and partner, of Bangor, lessees.

*Index (Wylie) Mine* (Drift).—See our Xth Report, p. 138. It is on Middle Butte Creek, 3½ miles S.E. of Nimshew, at 1,250′ elevation. An old claim on an ancient lava-capped channel, whose general direction

s N.E., is being reopened. The water is being pumped out of an old 300′ incline, which shows 3′ to 4′ of gravel. About 50′ lower a tunnel has been started in the bedrock to bottom the channel, and is 100′ in length at present. Three men are at work. N. A. Harris, of Lovelocks, owner.

*Inskip Mine* (Quartz).—See our XIIth Report, p. 84. It is in Sec. 29, T. 25 N., R. 4 E., ½ mile S.W. of Inskip. Thomas McVeigh, of Inskip, owner.

*John Dix Mine* (Drift).—See our XIIth Report, p. 85. It is on the west branch of Butte Creek, 6 miles N.W. of Lovelocks, at 2,000′ elevation, and comprises 200 acres on the Portuguese Point channel. It is opened by a 2,800′ incline, and the gravel is breasted out 300′ wide and from 4′ to 5′ high; all of the gravel has to be blasted. When running full-handed, 40 carloads of gravel per shift is the output. Posts and caps are used in breasting, and full sets in the incline. About 2,800′ of the channel has been worked. The hoist is run by water-power, the water coming from west branch of Butte Creek through 2 miles of ditch of 400 miner's inches capacity; lower down the creek a second ditch, known as the Freeze-Out ditch, of 700 miner's inches capacity and a grade of ½″ to the rod, is taken out. There are 200′ of 18″ flume with slate riffles. The gold is coarse. Five men are employed. — McCormick, of Berdan, manager.

*Jones Bros.'* (*Reese*) *Mine* (Drift).—See our XIIth Report, p. 85. It is in Sec. 29, T. 25 N., R. 5 E., 10 miles S.E. of Chaparral, and is the south extension of the Butte King and Queen Mine. Jones Bros. et al., of Chaparral, owners.

*Kickapoo Mine* (Drift).—See Burgstrasser.

*Kline & Malone Mine* (Placer and Quartz).—It is on Big Butte Creek, 2 miles W. of Lovelocks, at 1,750′ elevation, and comprises 20 acres. The surface ground is being ground-sluiced to uncover the outcrop of a vein striking N.W. and dipping N.E. There is a foot-wall and a decomposed hanging-wall, presumably originally serpentine, which, it is claimed, carries gold. Water is obtained from an old tunnel above, and gathered in a reservoir 300′ above the point being worked. Three men are employed. B. G. Kline and M. Malone, of Nimshew, owners.

*Last Chance Mine* (Placer).—It is on Big Butte Creek, 3 miles W. of Lovelocks, at 850′ elevation. The creek is flumed for a distance of 280′; it is 16′ wide at the upper and 9′ at the lower end, 2′ deep, with 3″ to 16′ grade. The season lasts from July to November. There is a 12″x14″ sub-flume 280′ long, set on a 3″ to 16′ grade. At the lower end is a 10′ current-wheel, which runs a derrick with 40′ mast and 30′ boom. A second flume current-wheel drives a Chinese pump. Five men are employed. Norris, Waldow & Co., of Lovelocks, owners; J. N. Smiths, of Lovelocks, superintendent.

*Lost Treasure Mine* (Quartz).—See our XIIth Report, p. 86. It is in Sec. 28, T. 26 N., R. 4 E., and Dutch Creek, ¾ mile N.E. of Inskip. J. Hedges et al., of Inskip, owners.

*Lucky Bob Mine* (Quartz).—See our XIIth Report, p. 86. It is on Feather River, 4 miles N. of Oroville. Col. Frank McLaughlin, of Santa Cruz, Santa Cruz County, owner.

*Magalia Drift Mining Co.'s* (*Perschbaker, Lucretia*) *Mine* (Drift).—See our VIIIth and XIIth Reports, pp. 119 and 87. It is 3 miles N.E. of

Magalia, near Butte Creek, at 2,800′ elevation, and comprises ½ mile on the supposed course of the channel. A 5′x 10′ double-compartment perpendicular shaft has been sunk 502′ to bedrock through lava conglomerate, wash, and compact lava. It is timbered with 8″x 8″ plates, and tightly lagged. On account of seepage from the flooded former works, sinking progressed slowly. The system of pumps includes a compound differential plunger, with a capacity of 500 gals. per minute, with a head of 250′ under 95 lbs. air pressure for sinking purposes; a compound duplex Dow pump at the 245′ station, with a capacity of 500 gals. per minute; a Worthington 8½″ plunger at the 320′ station, with 10″ stroke and 100 gals. capacity; besides relays of a Dow sinking and two Hooker pumps. The entire amount of water being raised amounts to 480 gals. per minute. These pumps are operated with compressed air, adding sufficient steam for reheating purposes. The plant is furnished with two 60 H.P. boilers. The compressor is driven by a Pelton wheel, and the hoist by a 6′ Pelton. The 900 miner's inches of water for power is brought from the Cherokee ditch through 2 miles of ditch and 1,850′ of 30″ and 1,850′ of 26″ pipe. Seventy-five men are employed. An incorporated company, owner; N. D. Rideout, of Marysville, president, and J. T. Markill, of Magalia, superintendent.

*Mammoth Mine* (Quartz).—See Excelsior.

*Mascot Mine* (Quartz).—See our XIIth Report, p. 86. It is 6 miles from Oroville. Mine and 10-stamp mill idle. Mascot Mining Co., of Yolo County, owner.

*Matheson* (*Meredith*) *Mine* (Quartz).—It is 4½ miles N. of Nimshew at 2,000′ elevation. The 10″ vein courses N.W., and dips 30° E., between a serpentine hanging-wall and a slate foot-wall, carrying a talc casing next the hanging-wall. An open cut, now 400′ long, is being washed along the outcrop, with 150 inches of water from the Cherokee ditch, and through 300′ of 11″ pipe, under 130′ pressure; in winter free water is used. The sluices are 200′ long, 20″ wide, and set on a grade 12″ to 16′. The quartz, which carries coarse gold and sulphurets, is crushed in an 8-stamp mill, with 850-lb. stamps, run by a 45 H.P. engine, which will shortly be replaced by water-power. Four men are employed. D. A. Matheson, of Nimshew, owner and superintendent.

*Mattie Mine* (Quartz).—It is near the Miners ranch, 8 miles E. of Oroville, at 1,100′ elevation. There are two veins on the property, an E. and W. and a N. and S. vein, the latter very large, but barren. The E. and W. vein dips 40° S., between greenstone and slate, and varies from 8″ to 30″ in width. There are two shafts, 1,400′ apart, 50 and 10′ deep; on the former, a drift is being carried east. The quartz carries a large percentage of sulphurets, said to be of high grade. Two men are at work. R. M. Green and F. Elliott, of Oroville, owners.

*Mesilla Valley Blue Gravel Mining Co.'s* (*Welch*) *Mine* (Drift).—It is 1 mile N. of Pentz, and contains 240 acres, at 1,020′ elevation. It is an ancient lava-capped, blue gravel channel, carrying about 25′ of gravel, 6′ next the bedrock being excavated. This gravel carries 60% of bowlders and cobbles that are all stored in the mine. The gold is fine in size and quality. It was formerly worked as a hydraulic. A tunnel has been driven 200′ from the face, and gangways 6′ high and 400′ long are carried up the channel on the slate bedrock. No breasting is being done at present, the gangways being pushed ahead. Water for washing is obtained from the Miocene ditch, and the tail flume is 300′ long, 16

wide, and set on a 10″ grade. Four men are employed on two shifts. E. C. Wilson, of Pentz, owner.

*Mosquito Creek Mine* (Quartz).—It is ½ mile E. of Coutolenc, at 2,750′ elevation. The vein strikes N. and S. and dips 60° E. in slate, and where exposed in the creek it is 3′ wide. There are three parallel veins on the property. Excepting a 50′ tunnel and some shallow shafts, the property is not developed. Along the creek-bed is some good placer ground. Two men are at work. D. W. Reese and C. Jennings, of Coutolenc, owners.

*Mount Ida Mine* (Quartz).—It is 2½ miles N.E. from Hurleton, at 4,430′ elevation. The vein strikes N. and S. and dips 54° W. between diorite walls, showing an 18″ vein. There is a 25′ shaft sunk on the vein, which shows a heavily mineralized rock; also several open cuts and a short tunnel. Three men are at work. J. Pullen, of Hurleton, owner.

*Napa and Solano Counties Co.'s (Best) Mine* (Drift).—It is 3 miles W. of Lovelocks, at 2,100′ elevation, and comprises 40 acres. It is on an old channel with a S.W. course, and opened through a bedrock tunnel 650′ in length, from which there is a 30′ upraise into the gravel, which is breasted from 50′ to 100′ wide and from 5′ to 6′ high, and has been worked 600′ in length. The main tunnel is being driven ahead at present. Wash water is taken from the mine. There are 100′ of 12″ sluices with cross-riffles. Seven men are employed. J. M. Reams, of Suisun, Solano County, owner; J. Zweifel, of Lovelocks, superintendent.

*New Oregon (Forty-nine, Red Point) Mine* (Quartz).—It is 1½ miles E. of Enterprise, at 1,625′ elevation, and comprises 160 acres of patented ground. The vein strikes E. and W., dips 60° S., between slate and porphyry walls, showing 12′ in width. The quartz contains 0.5% of sulphurets, principally iron and lead. A cross-cut tunnel has been driven 150′ to the vein, giving 120′ of backs; a second tunnel, 150′ lower, has attained a length of 140′, but will require 350′ more to reach the vein. Short drifts of 30′ have been made on the vein in the upper tunnel. Nine men are employed, An incorporated company, owner; J. Champion, of No. 1921 Alice Street, San Francisco, superintendent.

*Nimshew Gold Mining Co.'s (Pewperingtuno) Mine* (Drift).—It is ½ mile W. of Nimshew, at 1,625′ elevation, and comprises 400 acres of ground. There are five channels on the company's ground, known as the *Blackleg, Cole*, etc. Their general course is N. 47° E., and they are from 10′ to 40′ in width, with 2′ average depth of gravel. The present workings consist of a 6′x 6′ tunnel running 1,300′ N.E. on the channel; the gravel is washed with 50 inches of water brought from springs owned by the company, through 13″ to 7″ pipe, under 47′ pressure, through sluices 14″ wide and set on a 10″ grade and furnished with slate riffles. The gold is coarse. On the Blackleg channel there is a 1,600′, and on a branch channel a 1,100′ tunnel. Seven men are employed. A San Francisco company, owner; G. C. Higgins, of Nimshew, superintendent.

*Oliver Twist Mine* (Placer).—It is 4 miles N. of Inskip, in Sec. 16, T. 25 N., R. 4 E., at 4,725′ elevation, and comprises 120 acres. Idle. Cassius A. Oliver, of Chico, owner.

*Oro Fino Mine* (Drift).—See our VIIIth, XIth, and XIIth Reports, pp. 118, 160, and 86. It is 5½ miles N.W. of Magalia, at about 2,100′

elevation, and comprises 270 acres. Since our last report the main tunnel has reached 2,700′ in length; at present idle, and awaiting a blower and pipe-line to secure necessary ventilation. L. Cohn, M. Goodday, and others, of Magalia, owners.

*Owl Mine* (Quartz).—It is 2 miles N.W. from Inskip, at 3,925′ elevation. The vein strikes N. and dips W., in porphyry, and shows a mere seam of extreme richness, which is followed into the hill by an open cut, at present covered by a slide which is being ground-sluiced. An old 8′ arrastra driven by a breastwheel is on the property. One man is at work. C. R. Parker, of Inskip, owner.

*Pactolian Mine* (Quartz).—It is 2 miles N. of Hurleton, at about 1,600′ elevation. The vein strikes N.E. and S.W., and dips S.E., between diorite slate walls, varying from 2′ to 8′ in width. A contract has been let to drive the tunnel 100′ ahead, which will be over 400′ long. Four men are at work. J. E. Miller, of San Francisco, owner; D. A. McDonald, of Hurleton, superintendent.

*Palace Mine* (Drift).—It is 2 miles W. of Lovelocks, at 2,100′ elevation, and comprises 260 acres. The course of the channel is N.E.; it is about 80′ wide, with 2′ to 4′ of gravel. It is lava-capped and with a sediment roof. The gravel consists of quartz and slate. The 6′ x 8′ main bedrock tunnel is 300′ in length, and a gangway is continued 1,250′ up the channel. Eight hundred feet of the channel has been breasted out, carrying 3′ of bedrock with the gravel. The gravel is washed through the tunnel with 60 inches of water from the Cherokee ditch. The flume has a 10″ to 16′ grade, and is cleaned up once per month. The tailings dump on the hillside facing Big Butte Creek. Two men are at work. Thompson, Doolittle & Co., of Nimshew, owners.

*Palo Alto Mine* (Quartz).—See our Xth and XIth Reports, pp. 129 and 164. It is 3 miles N. of Merrimac. The mine and the 2-stamp and 10-stamp mills are idle. Palo Alto Mining Co., of Merrimac, owner.

*Parry* (*Alki*) *Mine* (Drift).—See our Xth, XIth, and XIIth Reports, pp. 141, 161, and 87. It is 4 miles N.E. of Magalia, at 1,700′ elevation, and comprises 320 acres. Since our last Report a new 30′ overshot wheel has been built to handle the four pumps of 9″, 7″, 6″ and 5″, which raise 250 gals. of water per minute. The shaft has reached a depth of 1,000′ on the incline. Water is obtained from main west branch of Feather River through 12 miles of ditch, with a capacity of 300 miner's inches. One man is at work. — Parry, of Magalia, owner.

*Perschbaker Mine* (Drift).—See Magalia Drift Mining Co.

*Peweringtuno Mine* (Drift).—See Nimshew Mining Co.

*Phœnix Gold Mine* (Quartz).—See our XIIth Report, p. 87. It is in Sec. 26, T. 19 N., R. 5 W., 3 miles S. of Hurleton, at about 1,600′ elevation, and comprises three claims. Idle. J. L. Gibson et al., of Hurleton, owners.

*Pinkston Mine* (Quartz).—It is 10 miles E. of Yankee Hill, at 2,300′ elevation. The vein strikes N. and S., and dips nearly vertically E. in slate rock, with a width of 2½′ to 4′. A tunnel, now 80′ long, is being driven on the vein, where a perpendicular depth of 60′ is obtained. There is a 5-stamp steam-power mill on the property, with 250-lb. stamps capable of crushing 5 tons in twenty-four hours. The ore carries barium and is low grade. Five men are employed. William Pinkston, of Yankee Hill, owner.

*Porphyry Point Mine* (Drift).—See our XIIth Report, p. 88. It is 3 miles N. of Magalia, and comprises 30 acres on the channel. R. Shiplet et al., of Magalia, owners.

*Poumarat Mine* (Quartz).—It is on Little Butte Creek, 1½ miles N.W. from Lovelocks, at 2,600′ elevation. The 2′ vein strikes N. and S., and dips 45° E., between slate walls. A 6′ x 8′ double-compartment incline shaft has been sunk 100′ without a hoist. At 70′ depth a drift has been run on the vein 100′ N. Two men are at work. V. Poumarat, of Coutolenc, owner.

*Princess* (*Aurora*, *Church*) *Mine* (Drift).—It is 2½ miles N.E. of Magalia, at 2,400′ elevation, and comprises 320 acres. It is presumed to be on the same channel as the Perschbaker Mine, and has a N. 30° E. course, with a width of about 70′ on serpentine bedrock. The blue gravel is about 3′ deep, and carries coarse gold with 65% of cobbles and bowlders that are stored in the mine. There is an incline shaft 330′ deep on a 32° pitch. The present workings are on the east rim, and a cut is being made across the channel. The output of gravel averages 30 cars of 10 cu. ft. each, per day. There is a steam hoist, and the pumps are run by water-power derived from Little Butte Creek for part of the season; the remainder of the time 40 miner's inches are taken from the Cherokee ditch; the ditch is 1¼ miles, 4′ on top, 2½′ on bottom, and 18″ deep. The gravel is washed through 80′ of 14″ flume, set on a grade of 9″ to 12′, and furnished with Hungarian and slat riffles. Eight men are employed. An incorporated company, of Magalia, owner; G. E. Hogg, of Magalia, superintendent.

*Rainbow Mine* (Quartz).—See our Xth and XIth Reports, pp. 131 and 158. It is on Jordan Hill, 4 miles W. of Yankee Hill. Idle. Capt. Griffith, of San Francisco, owner.

*Ramona* (*Skipper*) *Mine* (Quartz).—It is on the west branch of the Feather River, 1½ miles S. of Magalia, at 1,900′ elevation, and comprises 40 acres. The veins strike N. 65° E., and dip 75° S.E. There are two veins in syenite, 3½′ and 10′ wide. There is a tunnel 46′ long on one of the veins, which gives 200′ of backs. An old 10-stamp mill, with 850-lb. stamps and double-discharge mortars, is arranged to be run by water, the Cherokee and Miocene ditches both crossing the property. The quartz is well mineralized, and said to carry high-grade sulphurets. Six men are employed. C. H. Ford, A. W. Morgenstern, and E. C. Hughes, of Magalia, owners; C. H. Ford, of Magalia, superintendent.

*Rawhide Mine* (Quartz).—It is 2 miles N. of Inskip, at 4,300′ elevation, and comprises 1,500′ by 600′. The vein, 4′ to 30′ in width, has a N. and S. course, dipping 75° E. between slate walls. A 5′x 6′ incline, 25′ deep, has been sunk on a stringer from the main vein, and 25′ of a tunnel run on the stringer nearly at right angles to the main vein. Four men are employed. Wylie Bros., of Inskip, owners.

*Red Point Mine* (Quartz).—See New Oregon.

*Republican Mine* (Drift).—See our XIIth Report, p. 88. It is on the Forks of the Butte, 4 miles N. of Lovelocks. P. N. Woods, of Lovelocks, owner.

*Resumption Mine* (Quartz).—It is 3½ miles E. of Hurleton, at 1,800′ elevation. The vein strikes N.E. and dips N.W. in a decomposed formation, with a varying width up to 2′. A tunnel is being driven on

the vein, and the ore is being worked in the Phœnix mill. Four men are employed. W. W. McMillan et al., of Hurleton, owners.

*Rock River Mines* (Quartz).—They are in Secs. 4 and 9, T. 20 N., R. 4 E., 9 miles N. from Oroville, at 1,200′ elevation, and embrace nine claims bonded to the Golden Gate Syndicate (Limited). Three claims belong to the Rock River Mine proper. The main works are on a vein with a N. 48° W. strike and a 45° S.W. dip. The formation is badly broken up, showing slate and diabase interlaced with quartz seams, the wall rocks being highly mineralized. The vein varies from 20″ to 3′ in width, and shows free gold in connection with arsenical pyrites. An incline on the vein is 300′ deep, with three levels run off, extending 300′, 275′, and 160′ N., and on two levels, 100′ S. A 15 H.P. engine furnishes the motive power for the hoist and a No. 4 Dow pump. Ten men are at work. — Fugua, of Oroville, superintendent.

*Scott Bar Mine* (Placer).—It is 4½ miles W. of Lovelocks, at 900′ elevation, and comprises 1,400′ by 2,800′ in two parallel claims. A bar on the channel of Big Butte Creek is being prospected. Water is taken from Big Butte Creek through 3½ miles of ditch of 300 miner's inches capacity and delivered under 100′ head. Idle. N. Logan, of Lovelocks, superintendent.

*Shakespeare Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 128, 163, and 88. It is at Forbestown. Idle.

*Skipper Mine* (Quartz).—See Ramona.

*Slater Mine* (Quartz).—It is 2½ miles E. of Enterprise, at 1,100′ elevation. The vein strikes E. and W., dips N. in granite, and varies from 7½″ to 4′ in width. It has been developed by a cross-cut tunnel 190′ long, connecting with a 4′x 5′ shaft, sunk 200′ on the vein. But little stoping has been done. A steam-power arrastra, 10′ in diameter, is connected with the tunnel by a tramway, and has a capacity of 6 tons a day, which is discharged into a settler after four hours' grinding. A water-right belongs to the property; water is diverted from Slater Ravine through 2½ miles of ditch, 15″ on the bottom, 12″ deep, with 16′ per mile grade, and a capacity of 160 miner's inches; it is good for six months in the year, and is delivered under 100′ pressure. Three men are employed. E. W. Slater, of Enterprise, owner.

*Spring Valley Mine* (Quartz).—See our XIth Report, p. 155. It is 2 miles S.E. of Cherokee, at 1,600′ elevation, and comprises 42 acres. The 5′ vein strikes N. 80° W., and dips 40° E., between greenstone and trachyte walls. Two tunnels have been driven, one above the other and 50′ apart: No. 1 runs 400′ on the ledge; No. 2 cross-cuts 800′ and has an upraise of 28′ to the vein, on which some drifting has been done. There is a 10-stamp steam-power mill, with 850-lb. stamps, on the ground, but not running. One man is at work. Estate of J. Nesbett, of Cherokee, owner.

*Spring Valley Gold Mining Co's. Mine* (Hydraulic).—See our VIth (Part II), Xth, and XIth Reports, pp. 24, 124, and 155. It is situated in Secs. 4, 5, 28, 29, 32, and 33 of T. 20 and 21 N., R. 4 E., comprising about 1,500 acres at Cherokee, and is frequently referred to as the *Cherokee Mine*. About 150 acres, with a face of 500′ depth, has been worked to bedrock, while nearly as much has been worked to within 15′ of bedrock. The bedrock gravel is cemented and requires to be disintegrated with powder. On account of litigation the mine has not been worked for a number of years, but several small companies have leased

portions of bedrock and old points that were left. These companies use water-power and 2 hand-power derricks, and the company's water. The company have two ditch systems; the first flows into a reservoir at Concow, and the second starts from this reservoir. There are 20 miles of main ditch, pipe, and flume between Cherokee and Concow; the ditch is 5′ wide on the bottom, and of 2,200 miner's inches capacity. The flumes are 5′ wide, and the pipes are 33″ in diameter. The upper system starts from Round Valley reservoir, on the west branch of Feather River, and drops into the Big Butte ditch, near Powellton, which heads 4 miles above on Big Butte Creek, and has a capacity of 2,000 miner's inches, and discharges into the Concow reservoir. The length of the entire ditch system is 80 miles. There are 4 ditch-tenders, and about 100 men working under the leases. An incorporated company, owner; J. B. Whitcombe, of Cherokee, receiver.

*Standard Gold and Silver Co.'s Mine* (Quartz).—It is at Hengy (Oregon City), 8 miles N.W. of Oroville, at 1,425′ elevation, and comprises two claims, carrying four parallel veins, that have a general N.W. strike and a 35° S. dip, in greenstone and syenite, and are from 18″ to 20″ wide. The quartz is said to carry 1½% of high-grade sulphurets. The pay-shoot is 170′ long, and pitches S.W. A 6′x 9′ single-compartment incline is 487′ deep, with stations at the 100′, 135′, 239′, and 387′ levels. Drifts extend as follows: From the 135′ level, 219′ N. and 227′ S.; from the 239′ level, 197′ N. and 200′ S.; from the 387′ level, 48′ N. and 105′ S. From the south drift of the second level a cross-cut, now 100′ long, is being driven into the foot-wall to intersect a back vein. The ground is stoped from the second level up. Most of the ore is obtained below the third level. The motive power for the whole plant is a 20 H.P. engine. The mine is very wet, and requires 3 Knowles pumps, Nos. 7, 6, and 4, placed at the third and fourth stations, with one as auxiliary, and several Hooker pumps. The ore, when hoisted, is delivered direct to the grizzly and rock-breaker, and is reduced in a 4′ Bryan roller-mill, working 52 revolutions per minute, and crushing 10 tons per day. The pulp is passed to a Midas amalgamator, running 35 revolutions per minute. The mill contains two Frue vanners, driven by a 4 H.P. engine. Twenty men are at work. An incorporated company, owner; C. M. Wooster, of San José, secretary; W. S. Williams, of Hengy, superintendent.

*St. Lawrence Mine* (Quartz).—It is 2 miles N. of Inskip, at 4,325′ elevation, and comprises 825′ by 600′. The vein courses N.W., and dips E., in slate. It is developed through a few cuts and shallow pits. Idle. J. D. Williams, of Inskip, owner.

*Strang's Mine* (Drift).—It is ¼ mile W. of Hengy (Oregon City), at 1,375′ elevation, and comprises 240 acres, embracing an ancient channel. A tunnel was run 400′, but found to be too high; a shaft, now 50′ deep, is being sunk below the tunnel level, and is in pipe-clay and bowlders. From the surface indication and float a paying quartz vein crosses this claim, though it has not been definitely located. Two men are at work. C. Strang and L. Bottcher, of Hengy, owner.

*Turner Mine* (Drift).—See our XIIth Report, p. 89. It is 1 mile E. of Bangor, and comprises 1,000′ on the channel. Idle. Turner Drift Mining Co., of Marysville, Yuba County, owner.

*Westcott Mine* (Drift).—It is on the south edge of Philbrook Valley, at 6,000′ elevation, and comprises one claim on the same channel and

adjacent to the Butte King and Butte Queen mines. There is a 600′ tunnel in bedrock on west rim, with inclines on 4½% grade and 30′ apart to the channel. The gravel is hard and mostly quartz, and carries coarse gold. Four men are employed. C. Westcott, of Powellton, owner.

*Wild Yankee* (*Bessie*) *Mine* (Quartz).—It is 3¾ miles N.W. from Inskip, at 3,925′ elevation. The claims cover three veins, striking N.E., and dipping nearly vertically. The principal vein is 4′ wide in a syenite formation, and is prospected by a tunnel and several open cuts. On the other veins there are two tunnels and an incline. The rock is reduced in an 8′ water-power arrastra. Two men are employed. C. T. Salisbury and C. E. Bloomfield, of Inskip, owners.

*Wilson Mine* (Drift).—It is 3½ miles N. of Magalia, at 2,500′ elevation, and comprises about 1,200 acres. A vertical three-compartment shaft has been started for the bedrock 200′ below, and is supplied with a steam hoist. A tunnel has been driven 300′ on and in the bedrock. None of the channel has been developed yet. Twenty-five men are employed. Gold Banner Syndicate, of London, owner; S. P. Moody, of Magalia, superintendent.

*Woods Mine* (Drift).—See our Xth Report, p. 140. It is in Sec. 26, T. 24 N., R. 3 E., and 4 miles N. of Lovelocks. Peter Wood, of Lovelocks, owner.

*Wylie Mine* (Drift).—See Index.

## MILLS IN BUTTE COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Banner | Electric | 10 | 850 | 40 | 2<br>1 | Triumph<br>Johnson | | | | |
| Crystal Hill | Water | 4 | 750 | 6 | | | | | | |
| Crystal Peak | Water | 2 | 750 | 3 | | | | | | |
| Excelsior | Water | 4 | 350 | | | | | | | |
| Gold Bank | Water | 40 | 800 | 144 | 16 | Frue | 1 | 3 tons. | | 4,800 sq. ft. |
| Golden Summit | Steam | 10 | 850 | 20 | 2 | Woodbury | | | | |
| Matheson | Steam | 8 | 850 | 16 | | | | | | |
| Pinkston | Steam | 5 | 250 | 10 | | | | | | |
| Rainbow | Water | 5 | 750 | | | | | | | |
| Ramona | Water | 10 | 850 | | | | | | | |
| Spring Valley | Steam | 10 | 850 | | | | | | | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN BUTTE COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity, | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Catskill | | 2 | Arrastra | 10′ | 60 | | | | | | |
| Clarke Bros. | Steam | 1 | Arrastra | 12′ | 4 | | | | | | |
| Edna | Water | 1 | Arrastra | 8′ | | | | | | | |
| Owl | Water | 1 | Arrastra | 8′ | | | | | | | |
| Phœnix | Water | 1 | Bryan | 4′ | 12 | 1 | Johnson | | | | 40′ long. |
| Slater | Steam | 1 | Arrastra | 10′ | 6 | | | | | | |
| Standard | Steam | 1 | Bryan | 4′ | 11 | 2 | Frue | | | | |
| Wild Yankee | Water | 1 | Arrastra | 8′ | | | | | | | |

## Calaveras County.

The long-continued success of the great gold mines at Angels has done much to attract attention to this and Tuolumne County, and to establish confidence in the large gold-bearing veins found all along the great gold belt. Carson Hill, which two years ago was almost deserted, has again become the scene of active operations, and no less than four separate companies are now at work reopening the famous mines which astonished the world with their richness in the early fifties. Between Carson Hill and Angels there are now in operation five mines, where in 1895 there was but one. These are all old locations and are being developed mostly by foreign capital. Smith's Flat has also revived, and the country between Angels and San Andreas is being prospected with encouraging results. In the immediate neighborhood of San Andreas new and promising mines have been opened, and near Mokelumne Hill the Esperanza Mine, so long idle, has been rehabilitated and is now said to be operated successfully. The Gwin Mine, which was closed about 1880, is being reopened and is looked upon as one of the coming mines of the county. The "East Belt" has been more active than for many years; prospectors are scouring cañon and hillside, and encouraging reports are frequently heard from that section.

The copper industry is improving very slowly. The mines at Copperopolis and at Campo Seco are idle and the production of copper for the past few years is from the leaching of great ore-piles. Generally speaking, the outlook for Calaveras is much improved.

*Adelaide Mine* (Quartz).—See our XIIth Report, p. 89. It is on the south slope of Carson Hill, and ¼ mile E. of Robinson's Ferry. The 100′ shaft is equipped with a water-power hoist. Idle during the past two years. Wood Bros., of Robinson's Ferry, owners.

*Alameda Mine* (Quartz).—It is 10 miles E. of San Andreas, and on the N. side of Indian Creek. A 100′ tunnel has been driven on the vein, which is 1′ to 4′ thick, and in black slate. The quartz extracted, about 130 tons, has been worked in an arrastra. Tramantin & Co., of Esmeralda, owners.

*Allison Mine* (Quartz).—See Garner Consolidated.

*Allison-Merrimac Mine* (Quartz).—It is on Carson Creek, 4½ miles S. of Angels, and consists of two claims worked jointly. A 140′ cross-cut tunnel has been driven on the dividing line of the claims, which encounters a quartz vein 100′ from the mouth, which has been drifted upon from both sides of the tunnel; that to the north exposing a banded vein 1′ to 3′ wide. The tunnel beyond the first vein runs through foliated black slate containing many veinlets of quartz and some pyrite. The entire zone, 40′ or more, is said to be gold-bearing in sufficient amount to constitute pay-rock. A second parallel vein appears to the west of that above, which has not yet been cut in the underground workings. Robert Allison, of Angels, owner.

*Alpine Mine* (Quartz).—It is 8 miles E. of San Andreas, and has been opened by two tunnels, one of which is 75′ in. The vein is 2′ to 7′ wide, carrying sulphurets of iron, zinc, and lead. The walls are mica schist. A thin dike, heavily sulphuretted, accompanies the vein. A 1,000′ tunnel may be driven, 50′ above the neighboring ravine, and will give 450′ of backs. W. B. Swank, of Mountain Ranch, owner.

*Altaville* (*Cherokee*) *Mine* (Quartz).—It is 1 mile N. of Altaville, and is equipped with a steam hoist and 8-stamp mill. Idle. B. R. Prince, of Altaville, owner.

*Angels* (*Fox*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 141, 150, and 89. Joins the Utica on the north. James V. Coleman, of San Francisco, owner.

*Angels Camp* (*Turner*) *Mine* (Quartz).—It is 1½ miles W. of Angels, in the lower part of Smith's Flat. A new shaft is being sunk and has reached a depth of 90′. Nine men are employed. Angels Camp Gold Mining Co., of London, owner; J. H. Roberts, of Angels, superintendent.

*Ant Hill Mine* (Quartz).—It is 2½ miles N.W. of Copperopolis. See Royal Consolidated.

*Augostini Mine* (Drift).—It is 4½ miles N.W. of San Andreas, near Golden Gate Mountain. The shaft is 200′ deep, and has a substantial hoisting plant. J. J. Augostini, of San Andreas, owner.

*Bailey Mine* (Drift).—It is ¾ mile N.W. of Camanche. A drain tunnel was being run, in August, 1895, to reach the channel. Four men are employed. D. Bailey et al., of Camanche, owners.

*Balaklava Mine* (Drift and Hydraulic).—See Meinecker & Sanguinette.

*Bald Hill Mine* (Quartz).—See Big Spring.

*Bald Hill Mine* (Quartz).—See Gold Reserve Consolidated.

*Banner Mine* (Quartz).—It is in the village of Glencoe. The shaft is 200′ deep. The mine and plant have fallen into decay through neglect. Phelps & Miller, of San Francisco, owners.

*Banner Mine* (Quartz).—See Mayflower.

*Banner Blue Gravel* (*Shephard*) *Mine* (Drift).—It is 16 miles N.E. of San Andreas, on Jesus Maria Creek. Development work is in progress. Banner Blue Gravel Mining Co., owner; Mark A. Shephard, of San Andreas, superintendent.

*Baumhogger Mine* (Quartz).—It is ½ mile N. of Altaville. A shaft was sunk 75′ in 1895, when work was discontinued and another started at a different point. Three men are employed. H. & W. Baumhogger, of Angels, owners.

*Beatrice Mine* (Quartz).—See Mayflower.

*Benson Mine* (Drift).—It is in Latimer Gulch, 4 miles W. of San Andreas, and is worked steadily, the cemented gravel being crushed in a 3-stamp mill. Four men are employed. Benson & Sons, of North Branch, owners.

*Belcher Mine* (Quartz).—It is on the Stanislaus River, near Parrott's Ferry. A tunnel has been run 75′ on a small vein of rich rock, which is usually heavily mineralized with auriferous sulphurets. Thomas Smith et al., of Angels, owners.

*Belle Mine* (Quartz).—See our XIIth Report, p. 90. It is ½ mile above Robinson's. Idle. E. W. Roberts, of Oakland, owner.

*Bence Mine* (Quartz).—It is at Esmeralda, on Indian Creek. A tunnel has been driven 100′ on the vein a few feet above the creek. Two men are employed. Adam Bence, of Esmeralda, owner.

*Big Horn Mine* (Quartz).—It is 2½ miles N. of Murphy. The vein is opened at several points along the outcrop for over 300′; the deepest shaft being 35′. A cross-cut tunnel has been driven to, and a drift run 100′ on the vein. The quartz is dark blue, almost black, and has a peculiar, greasy luster. Gold can be seen in many pieces of quartz, and sulphurets are quite abundant. A much decayed, irregular dike ac-

companies the vein, which occurs in mica schist. There is no machinery on the mine. J. W. Taylor, of Murphy, owner.

*Big Spring* (*Graham, Marble Springs, Bald Hill*) *Mine* (Quartz).—See our Xth and XIth Reports, pp. 150 and 174. It is 1 mile S. o Angels. Has only superficial development. L. Graham, of Angels owner.

*Binum Mine* (Quartz).—It is 7½ miles E. of San Andreas. A nev prospect, showing a 4′ vein. Floyd Binum, of Mountain Ranch, owner

*Birney Mine* (Quartz).—See our XIIth Report, p. 90. It is on th Birney ranch, 1¼ miles N.E. of Angels. In 1893 this mine was opene to a depth of 110′, and a cross-cut run east on the 100′ level. Whil under bond a 10-stamp mill, a ditch, and a flume were built, and som work done on the mine. The operations were soon suspended. It woul probably have been better to have put the cost of the mill into th mine, as the prospect is one deserving more thorough development, bu requiring no mill at present. T. L. Birney et al., of Angels, owners

*Bisbee* (*El Dorado*) *Mine* (Quartz).—It is in Smith's Flat, 1½ mile W. of Angels. Two shafts have been started 40′ apart, presumably o the foot and hanging walls of a zone of amphibolite schist bearing gold Considerable quartz occurs in this schistose belt in the form of smal veins. The old drift is 45′ deep and the new one 115′. In the latter drift has been driven 30′ south. The surface plant consists of a steam hoist and pump, but too light to control the water. There is also light 5-stamp mill used for prospecting. Besides free gold, the quart contains pyrite and copper glance, rich in gold. Ten men are employed W. A. Bisbee, of Angels, owner.

*Black Gorge Mine* (Quartz).—See Lindsey.

*Black Wonder Mine* (Quartz).—It is 8½ miles S.E. of West Point There are four veins in the claim, the most prominent ones being calle *Black Wonder* and *Eureka*. The development is superficial. The quart is heavily sulphuretted. Fred Greve, of West Point, owner.

*Blair Consolidated Mine* (Quartz).—It is 1½ miles W. of Angels. I is said to have considerable development, consisting of a shaft 350 deep, and several levels, cross-cuts, etc. Information about and admis sion to the mine were refused by the representatives in charge. Idle Blair Con. Mining Co., owner; James Schmedake, of San Francisco superintendent.

*Blazing Star Mine* (Quartz).—It is 1 mile E. of West Point, and i one of the mines in this district that has been worked steadily durin the past two years. The shaft is 450′ deep. During 1895 som cyanide experiments were made on its concentrates by J. D. Morgan who stated that, from an ore consisting largely of pyrrhotite and chal copyrite, the gold extraction was 88%; from marcasite, 92%, and fron pyrite, 94% of the assay values. It is claimed a 4% solution is employed to which is added some chemical substance (the nature of which i secret), which prevents, to a great extent, the decomposition of th cyanide. The gold is recovered in the usual manner on zinc shavings The average extraction on mixed ores is claimed to be 90%. The quart is crushed through a 40-mesh screen, the height of the discharge rang ing from 4″ to 6½″. Concentration is effected on Frue vanners and a 18′ canvas table. Ten men are employed. W. E. Foster, of Wes Point, owner.

*Blue Bell Mine* (Quartz).—It is 1½ miles N. of Glencoe. A prospect tunnel has been driven on the vein. Scott & McIntyre, of Toledo, Ohio, owners.

*Bolytho* (*Hardy*) *Mine* (Quartz).—See our XIIth Report, p. 93. It is ½ mile S. of Angels, and is supposed to be on the same zone as the Utica-Stickle Mine. A large amount of superficial work has been done. The principal development consists of two tunnels driven near the base of a hill 150′ high. They are each over 200′ long and have lengthy cross-cuts. The entire ore-channel is in amphibolite schist, in which are numerous quartz veins, large and small. Both quartz and schist contain gold and auriferous iron-sulphurets. A new shaft was commenced in September, 1895, and is to be sunk several hundred feet. Eight men are employed. A. N. Butts, of Angels, owner.

*Bonanza Mine* (Placer).—It is in Quartz Gulch, 1 mile N. of Murphy. Said to have produced a large amount of gold in former years. It is to be reopened. E. C. Loftus et al., of Sonora, owners.

*Boston Mine* (Quartz).—See Esperanza.

*Boston* (*North Hill*) *Mine* (Hydraulic).—It is 2 miles S.E. of Jenny Lind, and is one of the mines shut down by the anti-debris law. A force of men are cleaning bedrock, tearing out old flumes, etc. The gravel deposit was originally several hundred feet wide, and a large portion still remains unworked. The water used in mining here is obtained from the large reservoir in Salt Spring Valley. Twelve men are employed. Boston Gold Mining Co., owner; J. H. Southwick, of Milton, superintendent.

*Brown, Smyth, and Ryland* (*Suffolk or Smyth*) *Mine* (Quartz).—It is ½ mile N.W. of Angels. A 400′ cross-cut tunnel has been completed since our previous Report. It has intersected three gold-bearing veins of good size. Brown, Smyth, and Ryland Gold Mining Co., of Angels, owner.

*Brazza Mine* (Quartz).—It is 2½ miles N. of Esmeralda. A shaft has been sunk 70′ and several open cuts made along a dike which, near the surface, is much decayed. Lying under the dike is a gouge-like material 12″ thick, with a thin seam of quartz, usually lying next to the dike. In the gouge and quartz, pockets of coarse gold have been found. Antonio Leech et al., of Esmeralda, owners.

*Bruner Mine* (Quartz).—See Gold Reserve Consolidated.

*Buckhorn Mine* (Quartz).—See our XIIth Report, p. 90. It is 1 mile W. of Murphy. During the past three years considerable prospecting has been done. A tunnel to tap the old workings is being run, but has not reached them. Two men are employed. Buckhorn Cons. Mining Co., of Napa, Napa County, owner.

*Buckminster Mine* (Drift).—See Uptograph.

*Calaveras Consolidated* (*Santa Cruz*) *Mines* (Quartz).—See our Xth and XIth Reports, pp. 56 and 169. They are 7 miles S. of Angels, extending from the Stanislaus River up the south slope of Carson Hill. The new shaft, commenced in 1893, reached a depth of 500′, when work was suspended, and the mine remained idle until the summer of 1895, when the long tunnel near Robinson's Ferry was cleaned out and retimbered. Ten men are employed. Calaveras Cons. Mining Co. (Ltd.), of England, owner; P. F. Wood, of Robinson's, agent.

*California* (*Hicks*) *Mine* (Quartz).—It is 9 miles E. of San Andreas.

Prospecting work is in progress. Two men are employed. Frank Cuneo et al., of Esmeralda, owners.

*Canape Mine* (Quartz).—It is 1 mile W. of Carson, and has a 75 shaft on a small vein of rich quartz. Joseph Canape, of Angels, owner.

*Carlton Mine* (Quartz).—It is 4 miles W. of West Point, on the north side of the Middle Fork of the Mokelumne River. The vein is abou 10″ wide. The fissure is well defined, and the quartz high grade. It i crushed in arrastras. A series of dikes cut the vein at varying dis tances, and are parallel and dip into the mountain at an angle of 45° The pay-rock is found on both sides of the dikes. The intrusion of th dikes is evidently subsequent to the formation of the vein. The mine i opened by several adits, the longest being 200′. Three men are employed T. Carlton, of West Point, owner.

*Carson Creek Mine* (Quartz).—See our XIth and XIIth Reports, pp 173 and 91. It is on Carson Creek, 1 mile W. of Robinson's, at 900 elevation. The mine has a shaft 660′ deep, the first 75′ of which i vertical, the remainder being on a 45° angle; it is now proposed t reconstruct the upper part by making it conform to the lower. A larg new air-compressor is to be put in at once, and the mine systematicall developed. The hoist and 40-stamp mill are run by water-power Forty-two men are employed. Carson Creek Mining Co., of Watertown N. Y., owner; Naylor Williams, of Angels, superintendent.

*Casnelli* (*Mullen*) *Mine* (Quartz).—It is 4½ miles W. of San Andreas It has a tunnel 600′ long, which connects with a shaft 60′ from the sur face. Two men are employed. D. Casnelli, of San Andreas, owner.

*Central Hill Mine* (Hydraulic).—See our XIIth Report, pp. 91 and 482. It is ¼ mile S.W. of Murphy. The drain tunnel from Douglas Flat, commenced in 1892, was completed in 1894, and is 3,300′ long. A permit was obtained from the U. S. Debris Commission to mine by the hydraulic method, and active mining operations commenced. When water becomes scarce, in the latter part of summer, preparations are made for the winter and spring campaign by breaking up large masses of ground by heavy charges of powder. The south pit of the mine has been carried to the rim of a deeper channel, which has cut directly through the old Central Hill channel at a right angle. The drain tun nel passed 500′ through this later channel, which was previously un known; the upper portion is filled with coarse sand. All attempts thus far made to reach bedrock in the sand-channel have failed, owing to the large amount of water encountered. The Central Hill channel con tinues on its regular course south of the crossing of the sand-channel Twelve men are employed. Central Hill Mining Co., owner; W. Thomas of Douglas Flat, superintendent.

*Champion Mine* (Quartz).—See our XIIth Report, p. 91. It is miles W. of West Point. S. Rufino, of West Point, owner.

*Chaparral Hill Mine* (Quartz).—It is on the north slope of Chaparral Hill, 3 miles S. of Angels. It is opened by tunnels, the lower one being several hundred feet long. Idle. E. K. Stevenot, of Sonoma owner.

*Cherokee Mine* (Quartz).—See Altaville.

*Chapellet Mine* (Drift).—See El Encino.

*Cleveland Mine* (Quartz).—See Empire Consolidated.

*Cloud Mine* (Quartz).—See our Xth Report, p. 148. It is 2½ mile S.W. of Angels, near the road to Carson Creek Mine. It has tw

hafts, 45′ and 60′ deep, respectively, a cross-cut tunnel, and a large open ut. At and near the surface, the vein is found in black slates, dipping 5° E., but a short distance from the surface it becomes nearly horizonal, entering and cutting across hard, splintery diabase. Several thouand dollars were obtained from a pocket in the cut where the vein ssumes a horizontal position. In a shaft south of the cut some rich rsenical ores have been found. Two men are employed. Otto Dolling, f Angels, owner.

*Coffee-Mill Mine* (Drift).—It is 4 miles S. of Mokelumne Hill, on the ast slope of Golden Gate Mountain, and is on the Kreamer channel. he gravel is raised by a steam hoist, and washed in a large puddling ox. A shaft is to be sunk to open new ground. Twenty-six men are mployed. Coffee-Mill Mining Co., owner; James L. Gleason, of Mokelmne Hill, superintendent.

*Comet Mine* (Quartz).—It is 2 miles N. of San Andreas. Some years ince a large open cut was excavated here and two cross-cut tunnels, 300′ ong, run to the cut from the east. A 20-stamp mill was built and a arge quantity of rock (chlorite schist, diabase, and quartz) crushed, but, otwithstanding the exceptionally favorable facilities for economical ining and milling, work was stopped and the machinery removed. ra H. Reed, of San Andreas, owner.

*Cook Mine* (Quartz).—See our XIIth Report, p. 91. It is 1½ miles .E. of Angels. Assessment work only is done. S. Cook, of Angels, wner.

*Cosgrove Mine* (Quartz).—It is on the west hillside, in the town of ngels. There are two known veins within the limits of the claim. he east one is very similar to many others in this vicinity, being a omewhat irregular vein of quartz in altered diabase, which is often inluded in the vein in the form of chloritic or talcose material, both uartz and schist carrying gold and auriferous sulphurets. A vertical haft has been sunk 100′ on the vein, showing some improvement with epth; 200′ west of this vein a second mineral zone occurs in amphiolite schist, granular diabase lying between the two veins. A cross-cut unnel has been driven 100′ into the hill, in soft schists highly mineralzed. The main shoot lies on the foot-wall side of the zone, where is ound a concentration of sulphides of iron and copper containing gold. t is unlike any of the other mines thus far opened about Angels. harles Cosgrove, of Angels, owner.

*Costa Mine* (Quartz).—See Gold Reserve Consolidated.

*Crystal Mine* (Quartz).—See our Xth Report, p. 61. It is in Angels, short distance west of the Stickle Mine. Estate of James G. Fair, of an Francisco, owner.

*Culbertson Mine* (Quartz).—It is 1½ miles N. of San Andreas, near Murray Creek. A cross-cut tunnel, now in 175′, is being driven, which ill reach the vein in about 400′. Two men are at work. Culbertson Strough, of San Andreas, owners.

*Curtis Mine* (Quartz).—See Star of India.

*Cushing (Marshal) Mine* (Quartz).—It is between Angels and Altaille. — Cushing, of St. John, New Brunswick, owner.

*Dalmatia Mine* (Quartz).—It is 2 miles E. of Esmeralda, on Indian reek. The mine has been opened by a tunnel, 175′ in length, at the nd of which a drift has been run on the vein; from this a winze has een sunk 70′, and a second level opened near the bottom. The walls

are about 22′ apart, and in the zone lying between them veins of quartz, from mere seams to 6″ in width, have formed, dipping across the zone to the west and pitching along the ore-channel to the north. In these seams and veins the gold has been found, chiefly in masses, from a few cents to several hundred dollars in value. The quartz taken from the mine is worked in a water-power arrastra, after all the visible gold found in the pockets has been removed by hand-sorting. Two men are employed. Joseph Tramantin et al., of Esmeralda, owners.

*Dean Mine* (Quartz).—It is in Salt Spring Valley, near the Angels road, 8 miles E. of Milton. The vein is in, and forms a portion of, a dike cutting the black slates of the Mariposa formation. The dike rock is sometimes gold-bearing. The vein strikes N. and dips 20° W. The rock is crushed in a 2-stamp mill. Two men are employed. Mrs. V. M. Dean, of Milton, owner.

*Deer Lodge Mine* (Quartz).—See Pierce.

*Dodson & McQuig Mine* (Quartz).—See McQuig.

*Donnelan Mine* (Quartz).—It is 2 miles N. of San Andreas. A large open cut has been excavated, showing numerous small quartz and calcite veins in a much-decayed rock, probably diabase. Most of these veins dip west. One vein, 4′ wide, dips 40° E. A 5-stamp mill belonging to the property stands near the cut on the bank of the Calaveras River. A new ditch, to furnish a larger water-supply, is being constructed, and it was said ten stamps were to be added to the mill, as it was the intention to mill all the rock taken from the open cut. Should this prove unprofitable, then the richer shoots, streaks, and veins will be mined independently. Idle in August, 1896. John Donnelan, of San Andreas, owner.

*Dora Mine* (Quartz).—See our XIIth Report, p. 92. It is 3 miles N. of Murphy. A large amount of work has been done on this mine, including two tunnels, each several hundred feet in length, and a shaft 75′ deep. Most of the work has been done on a fine-appearing vein of blue ribbon rock, 4′ wide, that contains little or no gold. A new 5-stamp mill, ore-chutes, tramways, well-graded roads, etc., form a part of the property. Idle. Dora Mining Co., of San Francisco, owner.

*Dublin Mine* (Quartz).—It is 4 miles N.W. of Copperopolis, near the southern end of Salt Spring Valley. An incline had reached a depth of 90′ in August, 1895, and exposed a vein of quartz in a dike which appeared much seamed and broken. The quartz occurs in a succession of swells and pinches along or near the hanging-wall side of the dike and always within it; the quartz replacing the dike. Four men are employed. James Adams, of Copperopolis, owner.

*Dunlap Mine* (Quartz).—It is in Salt Spring Valley, near Towers Ranch, 8 miles E. of Milton. Considerable gold, it is said, has been taken from superficial workings, the rock being crushed in a 2-stamp mill belonging to the property. A new vertical shaft had reached a depth of 70′ in August, 1895. Three men are employed. F. Kuhn, of Milton, owner.

*Eclipse Mine* (Quartz).—It is 1½ miles N.W. of Angels, and has a 150′ shaft. Idle. T. E. Flagg, of Angels, owner.

*Edna Mine* (Quartz).—See our XIIth Report, p. 92. It is 3 miles N. of San Andreas, near Spring Gulch. The shaft has been sunk since the last Report to a depth of 145′, and cross-cutting and drifting done. Edn

Mining Co., of San Francisco, owner; J. S. White, of San Andreas, superintendent.

*El Dorado Mine* (Quartz).—See Bisbee.

*El Encino* (*Chappellet*) *Mine* (Drift).—It is in Chile Gulch, 4 miles S. of Mokelumne Hill. A new drain tunnel of several hundred feet in length was being driven in the summer of 1895. It has a 10-stamp mill. Three men are employed. El Encino Co., of Oakland, owner; James A. Regan, of Mokelumne Hill, superintendent.

*Emma Mine* (Quartz).—See Royal Consolidated.

*Empire Consolidated Mines* (Quartz).—They are 3½ miles N.W. of Copperopolis, and comprise a group of four claims, viz.: *Cleveland*, *Empire*, *Jumbo*, and *Uno*. Of these, the Empire was the only claim being worked. A cross-cut tunnel has been driven 240′ to the vein, where a level was run and winzes sunk. The quartz occurs as a replacement of the upper side of a dike, forming in a series of swells. The black slates of the Mariposa formation lie almost in contact with the vein on the foot-wall side, diabase forming the hanging-wall. The vein dips at an angle of 20° E. In some places the dike is entirely replaced by massive quartz. Eleven men are employed. F. B. Livingston, of San Francisco, superintendent.

*Enterprise Mine* (Quartz).—See Melones Consolidated.

*Esmeralda Mine* (Quartz).—See our VIIIth Report, p. 133. It is at Esmeralda, 10 miles S.E. of San Andreas. The vein occurs in the slates of the Calaveras formation, accompanied by a dike rock which forms a portion of the pay-shoots. There are two shafts, 100′ and 400′ deep, respectively. The latter has been retimbered to water level. The mine has recently been reopened. Hon. John F. Davis et al., of Jackson, owners.

*Esperanza* (*Boston*) *Mine* (Quartz).—See our XIIth Report, p. 90. It is on Indian Creek, 2 miles N.E. of Mokelumne Hill. After an idleness of several years it is being reopened. The inclined shaft has reached a depth of 340′, and levels run cross-cutting the vein diagonally. Several upraises were also made, and chutes built preparatory to stoping. On a level with the collar of the shaft an adit had been run several hundred feet on the vein, with numerous cross-cuts and branches. Some stoping had been done here in former years. The mineral zone exposed by these workings is from 40′ to 60′ wide, consisting of veins, stringers, and large, irregular masses of quartz in chlorite and talcose schists. The rock within this zone contains gold and auriferous sulphurets of iron, copper, lead, and zinc. The old 20-stamp mill has been almost entirely rebuilt, and 10 stamps more are to be added immediately. Fifty-five men are employed. Wm. Stewart, of Mokelumne Hill, superintendent.

*Eureka Mine* (Quartz).—See our XIIth Report, p. 92. It is 1 mile N. of West Point. Equipped with steam hoist and a 5-stamp mill. Idle. Joel Rowe, of West Point, owner.

*Everlasting Mine* (Quartz).—See our Xth and XIIth Reports, pp. 63 and 92. It is ½ mile S.W. of San Andreas. Patented. N. Seiffort, of San Andreas, owner.

*Excelsior Mine* (Quartz).—It is at Angels, a short distance E. of the Gold Cliff. It has a 120′ cross-cut tunnel and a 75′ shaft. John Meyers, of Angels, owner.

*Excelsior Mine* (Quartz).—It is a prospect, 1¼ miles N.E. of Mokelumne Hill. It has a 100′ tunnel. C. Peek, of Mokelumne Hill, owner.

*Falcon* (*Louisa, Carley*) *Mine* (Quartz).—See our XIIth Report, p. 94. It is 2½ miles W. of Murphy. Reopened in 1895. The shaft is 215′ deep, with a drift 50′ E. at that level. An adit was run several hundred feet, years ago, which connects with the shaft. The property is equipped with a steam hoist and 5-stamp mill. Fifteen men are employed. McCarthy Bros. & Hooper, of No. 113 Front Street, San Francisco, owners; W. H. Hooper, of Murphy, superintendent.

*Fellowcraft Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 149, 178, and 92. It is situated in the eastern outskirts of San Andreas, and has been reopened after an idleness of several years. A shaft has been sunk 216′ at an angle of 54°, and levels started at 50′, 100′, and 200′ depth, and a cross-cut run 100′ in the foot-wall country rock at the 100′ level. The surface plant consists of a steam hoist and air-compressor. A 10-stamp mill is being built. Twenty-three men are employed. Fellowcraft Mining Co., of Cleveland, Ohio, owner; T. L. Hobbs, of San Andreas, superintendent.

*Fenian Mine* (Quartz).—It is 5 miles N. of Murphy, near the Old Calaveras Mine, and has a shaft 90′ deep, now caved. Idle.

*Fine Gold Mine* (Quartz).—See our VIth Report (Part II), p. 34. It is 5 miles N.E. of Railroad Flat. Idle for years, but it is said operations are to be resumed. J. B. Haggin & Co., of New York, owners.

*Finnigan Mine* (Quartz).—It is on the east side of Carson Hill, near the Reserve Mine. Tarbut, Bicknell & Co., of Angels, owners.

*Flamm Mine* (Quartz).—It is 2 miles W. of San Andreas, between Calaveras River and Murray Creek. A cross-cut tunnel to tap the veir is 50′ in. Four men employed. Flamm Bros., of San Andreas, owners.

*Foote & Thompson Mine* (Quartz).—See Quartz Glen.

*Ford Mine* (Quartz).—It is ½ mile E. of San Andreas. In former years considerable gold was sluiced from the surface of this mine These old workings have exposed, in a small gulch, croppings over 100 wide, consisting of quartz, talc schist, and chloritic rocks. The quartz is much shattered, crumbling and breaking in small fragments with a hackley fracture; the whole mass is stained with iron oxide. In this broad mass a vertical shaft 20′ from the foot-wall was sunk to a depth of 120′. The foot-wall was encountered at 80′ depth. From the bottom of the shaft a cross-cut was driven 103′ E., but no hanging-wall was found. In sinking this shaft some very rich rock was found; telluride of gold and silver being associated with metallic gold. The old shaft was abandoned and a new inclined shaft, 200′ N. of it, was sunk 100′, at an angle of 60°, in the foot-wall. It is thought that this angle will prove to be the average dip of the vein. The shaft encountered some very rich gold and tellurium rock near the 100′ station. It is now 350′ deep with a drift and cross-cut at 100′, showing a vein 70′ wide, and at 180 a cross-cut 60′ in quartz. A station and level have also been cut out at 300′ from the surface. The plant consists of a steam hoist. Fourteen men are employed. Ford Gold Mining Co., of San Andreas, owner C. B. Ford, of San Andreas, superintendent.

*Fox Mine* (Quartz).—See Angels.

*Fritz Mine* (Quartz).—It is a claim between Angels and Altaville Idle. Joseph Eastman, of San Francisco, owner.

*Gardella Mine* (Quartz).—It is 1 mile W. of Mokelumne Hill. It is worked for pockets. Charles Gardella, of Mokelumne Hill, owner.

*Garner Consolidated Mines* (Quartz).—This property lies partly in Amador and partly in Calaveras County, on the Mokelumne River, ¼ mile E. of the Big Bar bridge, midway between Jackson and Mokelumne Hill. It consists of three claims, the *Allison* and the *Tripp*, in Amador County, and the *Garner*, in Calaveras County. The Garner is the only one in operation. The vein, from 2′ to 5′ wide, is well defined, and was superficially worked ("coyoted") for a distance of nearly 1,000′, in former years; besides which, a long cross-cut tunnel was run to the vein. A tunnel is now being driven, and a shaft sunk on the vein. The mill is 1,500′ distant from the present workings, and on the other side of the river, in Amador County; they are connected by a tramway, which crosses the river on a suspension bridge of about 300′ span, constructed of old wire mine-cables. The cars descend by gravity to the bridge, across which they are hauled by mules, thence they ascend an incline to the mill by means of a wire rope. The empty cars are hauled to the mine by mules. The mill, wire rope on the incline, air-compressors that furnish air to the drills at the mine, etc., are operated by water-power derived from a 3′ turbine wheel, operating under a 12′ head. About 2,000 miner's inches of water is diverted from the river and carried through a short ditch to the wheel. The mill has 10 stamps, rock-breakers, concentrators, etc., and crushes about 30 tons daily. The manager furnishes the following figures: Cost of mining, about 45 cents per ton; cost of milling, 40 cents per ton; transportation from mine to mill, 15 cents per ton, or a total of about one dollar. Eighteen men are employed. Garner Consolidated Mining Co., owner; S. H. Lucas, of Jackson, superintendent.

*German Ridge Mine* (Quartz).—See our Xth Report, p. 148. It is on German Ridge, 4 miles N.E. of Angels. Extensive superficial workings were made in search of pockets, and also for copper. One of the old tunnels was driven over 450′ through hard greenstone. On the apex of the ridge is a massive quartz vein, which may be traced several hundred feet, but apparently none of the underground workings have yet reached it. Two men are employed. W. H. Steffler et al., of San Andreas, owners.

*Ghost Mine* (Quartz).—It lies about 600′ E. of the Utica-Stickle lode, and just outside the town limits of Angels. A new hoisting plant has been built, and the shaft, now down 200′, will be sunk to a depth of 600′. Six men are employed. C. W. Tryon, of Angels, owner.

*Gladstone Mine* (Quartz).—It is ½ mile S.W. of Murphy. There are six veins in the claim. A tunnel, now 125′ long, has been run to intersect them. E. H. Schaeffle, of Murphy, owner.

*Gold Cliff Mine* (Quartz).—See our Xth and XIIth Reports, pp. 60, 150, and 92. The great open cut on this mine has grown larger, year by year, until it is now over 500′ long, 150′ deep at the deepest part, and from 20′ to 80′ wide on the bottom, and over 200′ wide at the top. Thirteen men are employed. Hayward et al., of Angels, owners.

*Gold Hill Mine* (Quartz).—See our XIth and XIIth Reports, pp. 171 and 93. It is on Smith's Flat, 1½ miles N.W. of Angels. The pay zones, of which two are prominent, are in amphibolite schist, much decayed near the surface, heavily mineralized with iron oxides, and are from 10′ to 30′ wide, and about 30′ apart. The open-cut system of min-

ing has been adopted, both shoots being worked by a single excavation. The mill has 10 stamps, crushing, it is claimed, 60 tons of this soft material daily. The brass-wire screen is 20-mesh, with 6″ height of discharge. It is said that the loss in tailings is only slightly greater than when a fine screen is employed. Eleven men are at work. Gold Hill Mining Co., owner; S. V. Ryland, of Angels, superintendent.

*Gold Hill* (*Lewis*) *Mine* (Quartz).—See our XIIth Report, p. 93. It is a pocket mine, ½ mile S.E. of Vallecito. Burnell & Johnson, of Vallecito, owners.

*Gold Reserve Consolidated* (*Bruner, Costa, Bald Hill, and Romarggi*) *Mines* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 59, 174, 90, and 93. They are 2 miles S. of Angels. The principal mine is the *Gold Reserve* (*Bruner*). The developments consist of a shaft 155′ deep with levels at 60′ and 80′; at the bottom of the shaft a cross-cut had been run 125′ E. In August, 1895, further exploration was commenced by the new owners. The mine is now idle. Consolidated Gold Reserve Mining Co., owner; James Deitrick, of Angels, superintendent.

*Gold Valley Mine* (Quartz).—It is 2½ miles W. of Angels, and has a 50′ shaft. H. F. Ricketson, of Angels, owner.

*Golden Cup Mine* (Quartz).—It is 8 miles S.E. of San Andreas. It was discovered since our last Report was issued, and is being worked vigorously. It is one of the peculiar sinks in limestone, such as have been found at Cave City, Columbia, etc. Three men are employed. George Hengen, of Murphy, owner.

*Golden Hill Mine* (Quartz).—It is 2½ miles W. of San Andreas. The vein is 4′ to 7′ wide, and has been opened by two shafts, 60′ and 100′ deep, respectively, and from these 300′ of drifts run. Within the limits of the claim there are five other undeveloped veins lying parallel, and ranging from 3′ to 50′ wide. Patented. L. A. Irvine et al., of Angels, owners.

*Golden Queen Mine* (Quartz).—It is 6 miles N. of Murphy, on the divide between Indian and San Antonio creeks. The vein has been opened by three tunnels: the upper one is 200′ long, and connects by a raise with the surface; the middle and lower tunnels are 350′ and 450′ long, respectively. The last has not yet reached the pay-shoot, though driven on the fissure. In the upper workings two shoots are exposed, each 30′ in length and 2′ to 5′ wide. The walls are black slate and the quartz is found to be intimately associated with a dike, the latter sometimes forming a portion of the pay-rock. When this occurs the dike rock is silicious and granular. The quartz is both massive and crystallized, and is for the most part white or gray; but some portions are dark blue. Gold is visible in many pieces of the latter variety. J. E. Genung, of No. 101 Devisadero Street, San Francisco, and others, owners.

*Goodenough Mine* (Quartz).—See Royal Consolidated.

*Gottschalk Mine* (Quartz).—It is 1½ miles N.W. of San Andreas, between the Calaveras River and Murray Creek. Years ago a shaft 110′ deep was sunk on the vein; parties holding a bond have sunk a new vertical three-compartment shaft, 5′x 15′ in the clear, to a depth of 120′; thence to a depth of 193′, with two compartments. The first, 100′ from the surface, is timbered with 6″x 6″ timbers and 4″x 4″ posts. Below 100′ the plates are 6″x 8″, but the 4″x 4″ posts are continued. Such method of timbering is questionable. Though a new shaft in good ground, the wall-plates already show the weight of the walls, and are slowly bending under the

pressure. On the surface the vein is 4″ to 6″ wide; several small veins come in as depth is attained, until at the bottom the vein is 7′ to 10′ wide. It is one of the best prospects near San Andreas. A third new shaft is now being sunk, east of the two above mentioned. Six men are employed. C. V. Gottschalk, of San Andreas, owner.

*Graham Mine* (Quartz).—See Big Spring.

*Green Mountain* (*McSorley*) *Mine* (Drift and Hydraulic).—It is 1¾ miles S.E. of Mokelumne Hill, on the Tunnel Ridge channel. A permit was issued in 1895 to work by the hydraulic method, but was afterward canceled by the U. S. Debris Commission, owing to the failure of the impounding dam to give satisfactory results. A mill was then built and the mine successfully and continuously worked by the drift method. The mill has 8 stamps of 700 lbs. each. The screen is ¼″ mesh; 120 tons are crushed daily. This mine became noted some years since through the discovery of tons of quartz crystals, some of which were of immense size, weighing over 100 lbs. Beautiful specimens of opalized wood were also found at the same time. Ten men are employed. J. W. Smith, of Oakland, owner; John J. McSorley, of Mokelumne Hill, superintendent.

*Gurley Mine* (Drift).—It is 4½ miles W. of San Andreas, near Golden Gate Mountain. Sinking on this claim is in progress. Two men are employed. — Gurley, of North Branch, owner.

*Gwin Mine* (Quartz).—See our VIth (Part II), Xth, and XIIth Reports, pp. 30, 67, and 93. It is 4 miles S.W. of Mokelumne Hill, at 1,050′ elevation. Originally this mine was worked to a depth of 1,540′. All work was suspended in the latter part of 1882, and the mine remained idle until 1894, when a company was organized to reopen the mine. A vertical shaft was started in the hanging-wall slates, 485′ from the vein. Work was commenced May 1, 1894, and has been continuously prosecuted since, with the exception of a period of four months, while trying to tap the old works with a bore-hole and avoid a catastrophe of flooding from the old workings. The 8′x 15′ shaft is 5′x 12′ in the clear, divided into three compartments, and timbered from top to bottom with 12″x 12″ Oregon pine. It is sunk some distance north of the old workings. On August 8, 1896, the shaft was 1,335′ in depth. A station was cut at the 300′ level, and a tank of 4,000 gals. capacity constructed under the floor, for the purpose of taking up the surface drainage. At the 700′ level a station was cut and a reservoir of 12,000 gals. capacity constructed. A cross-cut was run west from the station 374′ through and beyond the vein, the foot-wall being encountered 124′ W. of the shaft. A drift was run 45′ N. and S. at this level on the vein. At the 1,000′ level a cross-cut was run 69′ W. through the vein, 15′ 6″ wide horizontal measurement, the foot-wall being 58′ W. of the shaft. A drift was run 125′ on this level, the vein being found to be 15′ wide; the material is somewhat mixed, but containing some good ore. At 1,195′ the shaft reached the hanging-wall of the vein, which at that point has a gouge 1′ thick. At 1,245′ the foot-wall, hard, black slate, was cut. At 1,307′ a station is now (August, 1896) being cut and chutes built. The development of the mine shows the strike to be N. and S. and the dip 77° E., and that the vein conforms very nearly in both strike and dip with the inclosing black slates. A dike of igneous rock is occasionally found accompanying the vein. It is light gray, fine grained, and appears to be a type of diabase. The surface plant

consists of a very substantial water-power hoist, with a 250 H.P. steam equipment, to be used in the event of failure of the water-supply. The grading for a 40-stamp mill is completed, and a contract has been let for a modern 40-stamp mill, complete in every detail, ready to run, including building, concentrators, etc., for $21,004. The shaft is sunk in black slate throughout its entire depth, except where passing through the vein. The following information is furnished by Mr. F. F. Thomas, E.M., superintendent:

The average rate of progress (exclusive of the four months of idleness) was 2′ per day. The cost of sinking, about $36 per foot. The most important items of expense are:

| | |
|---|---|
| For timber, in place in the shaft | $6 40 |
| For hoisting water, light, etc. | 1 00 |
| For the labor of excavation | 9 75 |
| For hoisting rock | 11 12 |
| Powder, fuse, and caps | 1 31 |
| Superintendence, freight, oil, taxes, etc., about | 6 42 |
| | $36 00 |

No power drills were used at any time; no posts are carried in the central portion of the shaft. Twenty-three men are employed. Gwin Mine Developing Co., of San Francisco, owner; F. F. Thomas, of Gwin-mine, superintendent.

*Hancock Mine* (Quartz).—It is a prospect, 2½ miles N.W. of Mokelumne Hill, near Middle Bar bridge. A cross-cut tunnel is being driven to reach the vein, which crops out at the roadside a short distance from the tunnel. C. O. Mitchell, of Mokelumne Hill, owner.

*Hard Lead Mine* (Quartz).—It is 4 miles E. of West Point. John Allen, of West Point, owner.

*Hardy Mine* (Quartz).—See Bolytho.

*Hartman Mine* (Drift).—It is 5 miles S.E. of Mokelumne Hill, on the Old Woman's Gulch channel. George Hartman, of Mokelumne Hill, owner.

*Hercules Mine* (Quartz).—It is a prospect, 4½ miles N. of Murphy. It has a 250′ tunnel and a 150′ shaft. Two men are employed. Cunliffe & Driver, of Murphy, owners.

*Hicks Mine* (Quartz).—It is in Salt Spring Valley, 4 miles N.W. of Copperopolis. The vein is found at contact of black slate and a dike, the latter sometimes forming a portion of the vein. It ranges from a few inches to 4′ in width. A cross-cut tunnel has been run 300′ to the vein, connecting with an upraise on the vein 130′ to the surface. John W. McCarty, of Copperopolis, owner.

*Holland Mine* (Quartz).—It is 1 mile S. of San Andreas. Prospecting work being done in 1896. William Holland, of San Andreas, owner.

*Homestake Mines* (Quartz).—See our XIIth Report, p. 93. They are at Collierville, 6 miles E. of Murphy. Only assessment work is done. William Collier, of Murphy, owner.

*Homestead and Guadaloupe Mines* (Quartz).—They are 1¾ miles S.E. of Glencoe. Idle. S. Tyson, of Glencoe, agent.

*Horswill Mine* (Drift).—It is 5 miles W. of San Andreas, on Golden Gate Ridge. After several years spent in an endeavor to ascertain the location of the channel by means of bore-holes, a long drain tunnel has been started, 400′ below the top of the ridge, and is now several hundred feet in. The plant consists of a gasoline-engine, operating a direct-

cting horizontal air-compressor, which furnishes air to the machine rills in the tunnel. The tunnel is driven in black slate and is well imbered and carefully lined. A shaft has also been sunk in the cap, which will be connected with the tunnel when the channel is reached. On account of so much water it has been found impossible to sink to bedrock anywhere on this channel. The development of this property s looked forward too with much interest by owners of other deep claims n this vicinity, as the Horswill Mine appears to be the key to the situation. Four men are employed. G. Horswill, of North Branch, owner.

*Hudson Mine* (Quartz).—See our XIIth Report, p. 94. It is ½ mile N. of North Branch. Idle. A. Macchiavello, of North Branch, owner.

*Hutchinson Mine* (Drift).—It is 1 mile S. of Mokelumne Hill, near Chile Gulch. Not continuously worked. Hutchinson & Co., of Mokelumne Hill, owners.

*Illinois Mine* (Quartz).—See our Xth Report, p. 149. It is on the Copperopolis road, 6 miles S. of San Andreas. The shaft is 130′ deep, and the south drift on the 100′ level has exposed a shoot of pay-rock. B. K. Thorn, of San Andreas, owner.

*Infernal Mine* (Drift).—It is 3½ miles S.E. of Mokelumne Hill, on the Tunnel Ridge channel, at 1,200′ elevation. This mine has been opened recently. Twenty men are employed. Anthony, Cope & Co., of Mokelumne Hill, owners; Frank Anthony, of Mokelumne Hill, superintendent.

*Iron Rock Mine* (Quartz).—It is 4 miles S. of Angels, on the north slope of Carson Hill. After years of idleness it is being reopened. A large open cut has been made on the vein, and other underground developments are in progress. The work is being done on a broad zone of quartz and amphibolite schist. Five men are employed. G. W. McNear, of Oakland, owner; — Rouse, of Angels, superintendent.

*Jackson Mine* (Quartz).—It is ½ mile S. of North Branch. It is worked in a desultory way for pockets. A. & J. Jackson, of North Branch, owners.

*Jenkins Mine* (Quartz).—It is 1 mile S.W. of Sheepranch. It is a new prospect in schist, accompanied by a dike. The vein is 2′ to 4′ wide. Jenkins & Wheelock, of Mountain Ranch, owners.

*Johnson Mine* (Quartz).—It is 2½ miles S.W. of Angels, on Long Gulch. A broad mineral zone has been prospected by a cross-cut tunnel 175′ long, and several surface cuts. Thomas Hardy, of Angels, owner.

*Jones Mine* (Quartz).—It is 2 miles E. of Glencoe. It is an old mine being reopened. It has a shaft 200′ deep. Four men are employed. M. Keating, of Glencoe, superintendent.

*Josephine Mine* (Quartz).—It is ½ mile E. of Esmeralda, on Indian Creek. A tunnel has been run 300′ diagonally across the slates to connect with a 150′ shaft sunk on the vein. John Saultry, of Esmeralda, owner.

*Jumbo Mine* (Quartz).—See Empire Consolidated.

*Jupiter* (*Keefer*) *Mine* (Drift and Hydraulic).—It is on the Central Hill channel, 5 miles S.E. of San Andreas. A reservoir was built in French Gulch this summer to supply this mine. Six men are employed. W. A. Keefer, of Angels, owner.

*Keefer Mine* (Drift and Hydraulic).—See Jupiter.

*Kelly Mine* (Quartz).—It is 3½ miles W. of Sheepranch. A tunnel has been driven 180′. J. C. Lewis, of Mountain Ranch, owner.

*Keltz Mine* (Quartz).—It is 4 miles N.E. of West Point, in granite. Idle. John Morgan, of San Francisco, owner.

*Kentucky House Mine* (Quartz).—It is 2½ miles S. of San Andreas. Being prospected. John Seiffort, of San Andreas, owner.

*Keystone Mine* (Quartz).—It is a new prospect at North Branch. J. H. Mester, of North Branch, owner.

*Keystone Mine* (Quartz).—It is in the village of Railroad Flat. A 100′ shaft has been sunk and a 250′ drift run. The crevice is 22″ wide, with a 12″ pay streak. The formation is black slate. The quartz contains sulphurets of iron, copper, and lead, and mispickel, besides free gold. It was an old mine which was reopened in 1895. Ten men are employed. E. C. Loftus, of Sonora, owner.

*Keystone Mine* (Quartz).—See Melones Consolidated.

*Lamphyre Mine* (Quartz).—It is ¾ mile N.W. of Camanche, and is worked through a drain tunnel, the main branch of which is 100′ long. Two men are employed. Larson, Kaiser & Co., of Camanche, owners.

*Lane & Tulloch Mines* (Quartz).—See Madison.

*Last Chance Mine* (Quartz).—It is a prospect on Carson Hill. G. W. Cortez et al., of Robinson's, owners.

*Last Chance Mine* (Quartz).—It is in the southern suburbs of Angels, on the Utica-Stickle vein. A three-compartment shaft was sunk 83′ in 1895, when the influx of water became too great to handle with a windlass. Drifts and cross-cuts were run at 50′ from the surface, for the purpose of learning something of the extent of the shoot. Some very rich quartz was found, which carried also sulphurets of iron and lead. The appearance of the rock is very similar to that of the Utica-Stickle Mine, but the shoot is entirely distinct and independent of the latter, though in the same mineral zone or vein. Idle. G. C. Tryon & Sons, of Angels, owners.

*Laswell Mine* (Drift).—It is on Balaklava Hill, 3 miles S. of Vallecito, and on the Cataract channel. Laswell Bros., of Vallecito, owners.

*Legal Tender Mine* (Quartz).—It is on Indian Creek, 5 miles N. of Murphy. A cross-cut tunnel has been run 120′ to the vein, and a shaft sunk 45′ on it. The quartz is good grade. George S. Taylor et al., of Murphy, owners.

*Leonard (Wiley) Mine* (Quartz).—See our Xth Report, p. 151. It is 2 miles N. of San Andreas, and on the north side of Murray Creek. It is an old prospect, reopened and equipped within the past two years. A cross-cut tunnel has been driven 400′ to the vein, and a complete 10-stamp mill was built at the mouth of the tunnel. After being in operation two months all work was suspended. The mill has been moved to the Fellowcraft Mine at San Andreas. W. S. Weymouth, of Drytown, Amador County, owner.

*Lewis Mine* (Quartz).—See Gold Hill.

*Lewis Mine* (Drift).—It is 1½ miles N. of Sheepranch. Worked by ground-sluicing. J. C. Lewis et al., of Mountain Ranch, owners.

*Lightner Mine* (Quartz).—It is in the northern suburbs of Angels. The surface ground (ore, and tailings from an old mill) was being worked in the Maltman mill, near Altaville. Joseph Eastman, of San Francisco, owner.

*Linderaxa Mine* (Quartz).—It is 1½ miles N.E. of Mokelumne Hill in the Mokelumne Hill River Cañon. A tunnel, over 400′ in length

xposes the vein, 1′ to 10′ wide, in diorite, which, near the vein, is splin-ered and often altered to chlorite schist. A 10-stamp mill has been rected 200′ below the tunnel, the quartz being sent down in a covered hute. Prospecting work was done, and the mine closed in the fall of 895. Linderaxa Mining Co., of Berkeley, owner.

*Lindsey* (*San Antonio, Black Gorge*) *Mine* (Quartz).—See our Xth and XIth Reports, pp. 151 and 174. It is 1½ miles W. of Angels. The levelopments consist of a 65′ incline and a 100′ vertical shaft. B. R. Prince et al., of Altaville, owners.

*Lockwood Mine* (Quartz).—See our VIIIth Report, p. 138. It is 2 miles E. of West Point, in granite. The shaft is 280′ deep, and is equipped with steam-hoist, air-compressor, etc. A very rich shoot of ore was found in sinking. Two veins were exposed in the shaft; one 14″ wide and the other smaller. The quartz was heavily sulphuretted, and showed considerable gold. Eight men are employed. Russell Mining and Milling Co., of San Francisco, owner; H. Calbick, of West Point, superintendent.

*Lone Star* (*Reed & Hillary*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 152 and 94. It is 2½ miles N.W. of West Point. Idle. M. Hurley & Co., of San Francisco, owners.

*Lone Star Mine* (Drift).—It is 1½ miles N.E. of Mokelumne Hill, on the Old Woman's Gulch channel. A 10-stamp mill has been built on the property since our last Report. Idle. H. B. Havens & Co., of Mokelumne Hill, owners.

*Long Gulch Mine* (Quartz).—It is 2½ miles S. of Angels, on Long Gulch. It has many superficial cuts, but no systematic development. Thomas Hardy, of Angels, owner.

*Lucky Tom Mine* (Drift).—It is 14 miles E. of San Andreas. The tunnel is in 200′, and still being driven. There is a 5-stamp mill on the mine, which was idle in consequence of too little ground having been blocked out. Its capacity is 60 tons a day. Twelve men are employed. T. Martin et al., of Mountain Ranch, owners; W. H. Clarey, of Sheep-ranch, superintendent.

*Macchiavello Mine* (Drift).—It is 5 miles N.W. of San Andreas. Idle. A. Macchiavello, of North Branch, owner.

*Madison* (*Lane & Tulloch, Matson*) *Mine* (Quartz).—It is in the south-western suburbs of Angels. See our Xth and XIIth Reports, pp. 151 and 95. The inclined shaft has reached a depth of 1,350′. Levels are opened at every 100′, the longest being at the 900′, where a drift extends 1,000′ N. toward the Gold Cliff, and also from the shaft 500′ S. Other levels are each several hundred feet long. The drifts are all of large size, 6′ to 20′ wide and 10′ to 20′ high. There are only a few places which might properly be termed stopes. The rock milled from this mine for several years past has been chloritic and talcose schists (altered diabase), containing, between the laminations of the schist, thin layers of quartz and calcite, together with about 4% auriferous pyrite. This zone is from 6′ to over 20′ wide, and lies under a massive quartz vein which runs entirely through the claim and beyond its limits. The quartz is from 4′ to over 60′ wide, as proven by numerous cross-cuts on the many levels. It is very low grade, and only a small amount of it has been milled. The pay zone in some places is in direct contact with this massive vein, and is as frequently found at some distance from it. Small banded veins, from a few inches to 2′, occur in various parts of the mine, lying on a

smooth, well-defined wall, and usually on the foot-wall side of the pay zone; these veins are higher grade than the average rock of the zone. Portions of the massive vein are granulated and crumbling, like coarse salt, due to pressure and movement subsequent to the formation of the vein. On the hanging-wall side of this vein a gouge is found, some places a foot, and in others several feet wide. It is filled with soft, putty-like substance, with fragments of quartz and diabase. No exploration has been carried into the diabase beyond this gouge. The surface plant consists of water-power hoist and air-compressor and a 40-stamp mill. Air drills are used almost exclusively in this mine. Thirty-eight men are employed. Hayward, Lane, et al., of Angels, owners.

*Maloney Mine* (Quartz).—It is near Hawkeye, 4 miles N.W. of Angels. A shaft, 65′ deep, August 1, 1896, is being sunk on the vein. Eight men are employed. Philip Deidesheimer, of San Francisco, owner.

*Maltman Mine* (Quartz).—It is midway between Altaville and Angels. Idle. James Maltman, of Angels, owner.

*Marble Springs Mine* (Quartz).—See Big Spring.

*Marshall Mine* (Quartz).—See Cushing.

*Matson Mine* (Quartz).—See Madison.

*Maxwell Mine* (Quartz).—It is 2 miles W. of Angels, and has a 60′ incline and a cross-cut tunnel, 260′ long, which is thought to be within 60′ of the vein. James Maxwell et al., of Angels, owners.

*Mayflower* (*Banner*) *Mine* (Quartz).—See our XIIth Report, p. 95. It is 1 mile W. of Murphy. After being actively developed in 1893 for a time, work was suspended. W. S. Edwards, of Calico, San Bernardino County, owner.

*McCreight, Hardy, and Tryon Mine* (Quartz).—See our VIIIth Report, p. 129. It is 3 miles S. of Angels on the north slope of Chaparral Hill, and is reputed to have produced a large amount of gold. The main tunnel is 700′ long on the vein. Hayward, Lane & Hardy, of Angels, owners.

*McKinley Mine* (Quartz).—It is 2½ miles S. of Angels, at the lower end of Albany Flat. Ownership in dispute. Claimed by John Meyers, of Angels.

*McQuig* (*Dodson & McQuig*) *Mine* (Quartz).—See our XIIth Report, p. 92. It is 2 miles W. of Murphy, and has three tunnels, 120′, 370′ and 193′ long, respectively. All are run on the crevice. The vein averages 1′ in width. Three separate shoots are exposed in the longest tunnel, and some stoping has been done. This is the only mine observed in this district where the quartz is not accompanied by a dike. The quartz is blue, has a banded structure, and carries auriferous pyrite, galena, and chalcopyrite, and free gold. Four men are employed. John McQuig, of Murphy, owner.

*McSorley Mine* (Drift and Hydraulic).—See Green Mountain.

*McSorley Mine* (Drift).—It is 5 miles N.W. of San Andreas. A shaft is being sunk through the volcanic cap to reach the channel. Two men are employed. J. M. McSorley et al., of Mokelumne Hill, owners.

*Meinecker & Sanguinette* (*Balaklava*) *Mine* (Drift and Hydraulic).—It is 2½ miles S. of Vallecito, on Balaklava Hill. Idle. Meinecke & Sanguinette, of Vallecito, owners.

*Melones Consolidated Mines* (Quartz).—They are on Carson Hill, and comprise the following mines: *Enterprise*, 457′; *Keystone* (*French and Wood*), 201′ (see our Xth Report, p. 57); *Melones*, 1,276′ (see our XIIth

Report, p. 95); *Mineral Mountain*, 2,563′; *Reserve*, 980′ (see our Xth Report, p. 58); and *Stanislaus*, 1,000′ (see our Xth Report, p. 57), together with three mill sites, containing 28 acres. The mines extend from near the Stanislaus River to the summit of Carson Hill. The Melones and Reserve mines have a large amount of development, and all the claims have had considerable work done on them. A cross-cut tunnel has been driven 260′ to the vein on the Stanislaus Mine, and drifting north was commenced in the latter part of 1895. Melones Cons. Gold and Silver Mining Co., of San Francisco, owner.

*Merrimac Mine* (Drift).—It is 4½ miles N.W. of San Andreas. A shaft is being sunk to reach bedrock. Phœnix Milling Co., of Sacramento, owner; John Shaw, of North Branch, superintendent.

*Merrimac Mine* (Quartz).—See Allison.

*Meteor Mine* (Quartz).—It is 8 miles E. of San Andreas, and is a new prospect with a 70′ shaft and a 150′ tunnel on the vein, which is about ′ wide. A 2-stamp mill has been built for prospecting. Two men are employed. W. B. Swank, of Mountain Ranch, owner.

*Mineral King Mine* (Quartz).—It is 12 miles N.E. of West Point, and s a prospect containing both gold and silver. J. Gouldson et al., of West Point, owners.

*Mineral Mountain Mine* (Quartz).—See Melones Consolidated.

*Montana Mine* (Quartz).—It is a prospect 2 miles W. of Mokelumne Hill, and has a 60′ shaft. J. W. Provard, of East Oakland, owner.

*Morgan Mine* (Quartz).—See our IXth and Xth Reports, pp. 37 and 57. It is 4 miles S. of Angels, on the summit of Carson Hill. The croppings of the vein consist of a great vein of quartz, nearly 100′ wide n places, and carry quite a large percentage of sulphurets. The vein has a ribbon-like structure, though not like the bluish banded quartz of smaller veins, and lies in nearly parallel waving bands, having a granular appearance. Its structure is entirely unlike any other massive quartz croppings observed in this section. Usually these great masses are flinty, milky, or glassy, containing little pyrites or gold. A 900′ cross-cut tunnel, with two branches, has been run into the mountain, from which a 100′ winze has been sunk and an upraise made to connect with the surface. In this cross-cut the great vein is seen to be 65′ wide, having the same banded structure as observed on the surface. The mine is still idle, as it has been for years. Estate of James G. Fair, and William Irvine, owners.

*Morning Star Mine* (Quartz).—It is 8 miles N.E. of Milton, on a tributary of Slate Creek. The croppings are quite prominent and prospect well. The quartz occurs in a broad dike of light gray rock, much decayed and stained by iron oxides near the surface. The quartz is found as a reticulated mass without any definite arrangement, though in a general way having a parallelism with the walls. The larger amount of the quartz occurs on the east—presumably hanging-wall side—the vein standing nearly perpendicularly. A shaft was sunk 40′, and at that depth encountered a slip; the vein was cut off and found resting on a floor of black slate. A cross-cut tunnel was run 120′ into the hill and encountered a second dike vein. A winze on this vein found it also faulted by the same slip. Search for it beyond the slip had been made, but the vein had not yet been rediscovered. Four men are employed. Robert Donner and Thomas Dolan, of Milton, owners.

*Moser Mine* (Quartz).—See Roanoke.

*Mount Nebo Mine* (Quartz).—It is on Red Hill, ½ mile W. of Vallecito. The shaft has reached a depth of 50′. Two men are employed. John and William Moyle, of Vallecito, owners.

*Mount Ophir Mine* (Quartz).—It is on Tunnel Ridge, 4½ miles S.W. of Mokelumne Hill, and is an old claim being reopened. The property also includes the *Woodstock* claim, which joins it. The shaft was 100′ deep. A shaft is being sunk on the Woodstock. Five men are employed. Fischer, Holmes & Perry, Columbia Bank, of San Francisco, owners; W. P. Ball, of Mokelumne Hill, superintendent.

*Mountain King Mine* (Quartz).—It is 3 miles N.W. of Copperopolis. An incline has been sunk 100′, and other superficial work done on a vein in a dike. W. Wamble, of Copperopolis, owner.

*Moyle Mine* (Drift).—It is 2 miles S. of Vallecito, on the Cataract channel. Ten men are employed. William Moyle, of Vallecito, owner.

*Muller Mine* (Quartz).—See Casnelli.

*Murphy District.*—The region for several miles east, west, and north of Murphy has for years been celebrated as one producing gold quartz of high grade. The placer mines about the town were rich and laid the foundation for several fortunes. There have been a few successes and many failures in the quartz mines of the district. The failures have been due to many causes; among them were the installation of machinery unsuited to the treatment of the ore; machinery of insufficient capacity to handle water; incomplete amalgamation in the mills, as proven by the assay value of several piles of tailings, and unskilled management. The veins of the district usually occur in mica schist, quartzite phthanite, or limestone of the Calaveras formation. The shoots are usually short; the veins irregular in size, and often accompanied by dikes. In some of the mines the dike is also gold-bearing, as at the Esmeralda and Golden Queen. The quartz is usually high-grade—$10 to $100 per ton. It is not necessary that each mine should have a mill to insure success. Two or three good custom mills, honestly and properly run, with all the modern devices to save sulphurets, slimes, etc., would be of direct benefit, if the mill charges were not exorbitant. This plan has been adopted in the Julian District, in San Diego County, with success. The quartz in Murphy District is sometimes white, but usually blue or bluish-black, of good grade. Most of the white and blue quartz of massive structure is worthless, and destitute of sulphurets. It emits a fetid odor when broken, and has a glassy, flaky appearance.

*Murray Creek Mine* (Quartz).—It is 7 miles E. of San Andreas, near Mountain Ranch. Idle. Murray Creek Mining Co., of San Andreas, owner.

*Neversweat Mine* (Quartz).—It is 1¼ miles N. of Sheepranch. It is a new prospect, with 20′ and 35′ shafts. J. C. Lewis, of Mountain Ranch, owner.

*New York Mine* (Quartz).—It is 2 miles N.E. of Railroad Flat, and has been idle a long time. It is equipped with steam hoist and rocker mill. The ownership is in dispute.

*Nixon Mine* (Quartz).—It is 1½ miles N. of West Point, and is a new prospect in granite. It has an incline 60′ deep. Two men are employed. Robert Nixon, of West Point, owner.

*Norfolk Mine* (Drift).—See our XIIth Report, p. 96. It is ½ mile E. of Murphy. The channel was found much disturbed, and unsatisfactory

esults generally are said to have closed the mine. John H. Heard, of Murphy, agent.

*North Hill Mine* (Hydraulic).—See Boston.

*North Star Mine* (Quartz).—It is 2 miles E. of West Point, and has a 0′ shaft on a vein in granite. M. D. Wickham, of West Point, owner.

*Old Calaveras Mine* (Quartz).—It is on the Sheepranch road, 5 miles N. of Murphy. A large amount of work was done on the mine years ago. The principal shafts are 100′ and 600′ deep. Dismantled. In the summer of 1895 a cyanide plant was built to leach the tailings, a large quantity of which have been impounded below the old mill. F. J. Horswill, of Valley Spring, owner.

*Oro y Plata* (*Willard*) *Mine* (Quartz).—See our VIth Report (Part II), pp. 35–42. It is ½ mile N. of Murphy, in limestone. Idle. John H. Heard, of Murphy, agent.

*Our Flag Mine* (Quartz).—It is 1 mile E. of Robinson's, on the divide, between Coyote Creek and the Stanislaus River. It is a pocket mine, from which considerable gold has been taken. Two men are employed. McArdle Bros., of Robinson's, owners.

*Particelli Mine* (Quartz).—It is a prospect, 3 miles W. of Mokelumne Hill. Idle. — Particelli, of Mokelumne Hill, owner.

*Petticoat Mine* (Quartz).—It is at Railroad Flat, and was worked years ago and then abandoned. Active steps are being taken to reopen it. W. H. Clarey, of Stockton, owner.

*Pierano Mine* (Quartz).—See Santa Ana.

*Pierce* (*Deer Lodge*) *Mine* (Quartz).—It is 7 miles E. of Murphy, on the slope of Stanislaus Cañon. The vein is small, and contains some high-grade quartz. Opened by several tunnels, 100′ to 150′ in length, and one shaft 80′ deep. Perry Condit, of Murphy, owner.

*Pineapple Mine* (Quartz).—It is a prospect, N.E. of Mokelumne Hill, and resembles the Esperanza. J. Harris, of Mokelumne Hill, owner.

*Pine Log Mine* (Quartz).—See our XIth Report, p. 168. It is 2¾ miles N.W. of Copperopolis. See Royal Consolidated.

*Pioneer Chief Mine* (Quartz).—See our Xth Report, p. 63. It is 1¼ miles W. of San Andreas, on the west or foot-wall fissure of the Mother Lode. The vein is found at contact of black slate and diabase, the latter on the foot-wall. On the dumps may be seen a large amount of crystalline limestone. Its stratigraphical relation to other rocks could not be determined, as the mine is inaccessible. The vein rock consists mostly of calcite and a little quartz, and a small percentage of sulphurets. B. K. Thorn, of San Andreas, owner.

*Plymouth Rock Mine* (Quartz).—See our VIIIth Report, p. 147. It is 6 miles N. of Milton, near Jenny Lind. The mine is developed by a large open cut and a tunnel on the vein, 200′ long, with several cross-cuts and chambers. These workings expose a broad zone of altered diabase, with the infiltration of quartz and auriferous pyrite. The latter occurs in streaks and bunches up to 30%. These highly mineralized portions are loosely coherent, and crumble easily. Between the heavily sulphuretted portions of the ore-shoot the rock contains disseminated pyrite, ranging from 1% to 10%. The oxidized ores near the surface contain free gold, but it is essentially a concentrating proposition, and to this fact is no doubt due the failure made when the mine was worked several years ago. The mine is being reopened and a new shaft sunk 100′, where a station has been made and cross-cuts and drifts run.

The north drift is 62′ in length. The Huntington mill has been rebuilt and a 12′x 50′ chlorination furnace erected. Twenty-two men are employed. Lane, Smith et al., of Angels, owners; T. T. Lane, superintendent.

*Point Rock Mine* (Quartz).—It is on the south side of Carson Hill. G. W. Grayson, of San Francisco, owner.

*Poorman Mine* (Quartz).— It is 1½ miles E. of Glencoe. After several years of idleness it is being reopened. Seventeen men are employed. Lawson & Co., of San Francisco, owners; C. L. Morrison, of Glencoe, superintendent.

*Poverty Mine* (Quartz).—It is on the Tower ranch, in Salt Spring Valley, 8 miles E. of Milton. The vein occurs in a dike, on which an incline has been sunk 60′, when a fault was encountered. They were endeavoring to find the vein. John Howard, of Milton, owner.

*Prince Mines* (Quartz).—They are "prospects," ¼ mile N. of Altaville, with only superficial development. B. R. Prince, of Altaville, owner.

*Pure Quill Mine* (Quartz).—It is ¾ mile W. of Angels, and is a new mine; a vertical shaft has reached 60′ in depth. Since our inspection *it is reported* that very rich quartz has been found at a deeper level. Idle. S. F. Godbe & Co., of New York, owners; James Dedrick, of Angels, manager.

*Putnam Mine* (Drift).—It is on the western slope of Central Hill, 4 miles W. of San Andreas. Ira H. Reed, of San Andreas, owner.

*Quaker City Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 144 and 65. It is 4 miles S.W. of Mokelumne Hill. It is idle, but a man is employed constantly in keeping the mine in good condition and running the pumps. A. Knell, of Mokelumne Hill, agent.

*Quartz Glen* (*Foote & Thompson*) *Mine* (Quartz).—It is near Rich Gulch, 6 miles N.E. of Mokelumne Hill. It was opened years ago by a shaft 120′ deep and a 1,000′ tunnel on the vein, but 240′ below the bottom of the shaft. A second tunnel, 275′ below the other, is 600′ long. In the latter the ore-shoot is 120′ long and pitches north. The strike of the vein is N. and S., and dips 70° W. On the opposite side of Alabama Gulch a third tunnel has been run 450′ north on the vein, all in quartz. A 20-stamp mill stands on the property. Forty men are employed. Roanoke Mining Co., of Mokelumne Hill, owner; W. T. Harris, of Rich Gulch, superintendent.

*Rathgeb-Union Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 147 and 63. It is 3 miles S. of San Andreas. Idle. Wm. Holland, of San Andreas, owner.

*Reed & Hillary Mine* (Quartz).—See Lone Star.

*Reef Rock Mine* (Quartz).—It is 3 miles N.E. of Angels. The vein is large and crops out boldly in diabase for several hundred feet. The developments consist of a 125′ tunnel, with cross-cuts, and a 35′ upraise to the surface. There are also several surface cuts 10′ to 15′ deep. In places the quartz contains considerable iron sulphurets. Idle. Geo. S. Taylor, of Murphy, owner.

*Relief Mine* (Quartz).—It is ½ mile S. of Angels, and has been worked for pockets in the amphibolite schist. A large quartz vein running through the claim has little or no development. Naylor Williams et al., of Angels, owners.

*Reserve Mine* (Quartz).—It is on the summit of Carson Hill. See Melones Consolidated.

*Right and Left Bower Mines* (Quartz).—They are 6 miles N. of Murphy, n a ridge between San Antonio and Indian creeks. The prospect is pened by tunnels. Two men are employed. Geo. McCullom et al., of Murphy, owners.

*Rising Sun Mine* (Quartz).—It is 1 mile E. of Robinson's, between Coyote Creek and Stanislaus River, and is a pocket mine on which here are several shafts and surface cuts. Besides gold in pockets, this ein produces a high-grade sulphuret ore, which is shipped. Two men re employed. McArdle Bros., of Robinson's, owners.

*Riverside Mine* (Quartz).—It is 2½ miles W. of West Point. See our XIIth Report, p. 96. T. J. Severns, of West Point, agent.

*Roanoke* (*Moser*) *Mine* (Quartz).—See our XIIth Report, p. 95. It is mile S.E. of Mokelumne Hill, and includes the Lamphyre, on the ame vein. Since our last Report several hundred feet of drifts have een run and a large, well-appointed station made at the intersection of he adit level with the vein. An upraise extends 140′ to the surface, hrough which a pipe passes and supplies water, under 200′ pressure, to Donnelly wheel located at the station. A geared hoist has been laced in the station and a shaft sunk, which had reached a depth of 00′ below the station level. The Roanoke vein dips W. at the surface, ut as depth is attained it nears the vertical, and in the bottom of the haft it dips slightly E. The Lamphyre Mine is an old claim, and is o be reopened. Its old 12-stamp mill is to be moved to the site of the Roanoke 8-stamp, water-power mill, making a 20-stamp mill, and a ramway will be laid from the new shaft to the mill. Fourteen men re employed. Roanoke Mining Co., of Stockton, owner; W. T. Harris, f Mokelumne Hill, superintendent.

*Romarggi Mine* (Quartz).—See Gold Reserve Consolidated.

*Rose Hill* (*Rodesina*) *Mine* (Quartz).—See our XIth Report, p. 176. t is 1 mile S.W. from El Dorado (Mountain Ranch Postoffice). Idle. Rodesino Estate, of Mountain Ranch, owner.

*Rose Rock Mine* (Quartz).—It is 3½ miles N. of Murphy, between San Domingo and Indian creeks. The vein varies from a few inches to 4′ in vidth, averaging about 1½′. Two tunnels have been run on the vein, he lower one being 240′ long. At 60′ from the face of this tunnel a vinze has been sunk 30′, giving a total depth of 175′ from the surface. The fissure cuts mica schists and is accompanied by a dike, and is very rregular. The quartz is partly white and partly dark blue, character- stic of this region. It contains iron, lead, and zinc sulphurets. Four nen are employed. Cunliffe & Driver, of Murphy, owners.

*Royal Consolidated Mines* (Quartz).—See our XIth Report, p. 168. The property comprises the *Ant Hill*, *Goodenough*, *Pine Log*, and *Royal Mines*. This group is located in Salt Spring Valley, about 2½ miles N.W. of Copperopolis. The Pine Log Mine has considerable develop- nent, the main incline being 115′ deep; besides, there is a large amount f superficial work. The upper portion of the vein has been stoped. This mine was idle, and the only active operations were in the Royal nd Goodenough mines, which are worked as one mine, the main incline eing sunk on the dividing line. The incline is 520′, and levels run at very 100′. The ore-shoots occur as a series of swells or lenses, large and mall, in a dike which has been injected at or near the contact of the black lates of the Mariposa formation and massive diabase, which lies east n the hanging-wall side. The quartz lies in parallel sheets or veins, and

as reticulated masses replacing the dike, and lying mostly along the hanging-wall side of the dike. The dike rock is often found to have become highly silicious, while still preserving much of its normal fine-granular appearance. It frequently contains gold and auriferous pyrite. The average thickness of the vein that is being stoped is 5′ or 6′. The vein is 4″ at the shaft, at the 400′ level. In the south drift it widens to 4′ in a distance of 10′, and a few feet above, in a stope, is 18′ to 20′ thick. This stope had a superficial area on the hanging-wall of 3,000 sq. ft., the wall being supported by a few well-placed posts (stulls), 16″ in diameter. There is no better standing ground in the State. The repeated pinching of this vein may be looked upon as an advantage in one way, as it leaves frequent substantial pillars to support the roof, consequently rendering an elaborate system of timbering or filling of stopes unnecessary. In a few places the vein has been found to split, forming two distinct shoots separated by barren dike rock. This, however, is not a common feature. Near the surface the vein dips 30° E., but is much flatter in depth, being about 20° on the 400′ level, and from 5° to 15° on the 500′ level. At the 500′ level a fault has cut the vein abruptly, the fractured end of the vein abutting solidly against a vein of quartz about 12″ thick, which dips 60° W. Immediately back of it is massive granular diabase. As the shaft had only been carried below this level to a sufficient depth for a sump, it is impossible to say what may be exposed by further developments. The steam 10-stamp mill is situated about ¼ mile from the hoisting works, and has two 6′ Frue vanners. The concentrates are shipped. A canvas plant formerly in operation has been abandoned. It is the intention of the management to move the mill to a point nearer the mine, and to add 10 stamps. There is still a large amount of milling rock in the Royal and Good-enough mines, while the remaining claims are almost wholly undeveloped. Fifty men are employed. Royal Consolidated Mining Co., owner; D. Jutton, of Copperopolis, superintendent.

*Safe Deposit Mine* (Quartz).—See our XIth Report, p. 172. It is at the upper end of Smith's Flat. Charles D. Smyth, of Angels, owner.

*Salt Spring Valley Mines.*—A gold belt extends through Salt Spring Valley from the vicinity of Copperopolis, in a northwesterly direction, as far as the neighborhood of Valley Springs, a distance of 15 miles or more. The valley lies between Gopher Ridge on the west and Bear Mountain on the east. Both of these elevated ridges are made up largely of diabase, diabase conglomerate, and amphibolite schist. The formation of the valley consists of foliated black slate of the Mariposa formation, diabase, amphibolite schist (altered diabase), and serpentine. The latter occurs in the form of elongated lenses along the east side of the valley. In the serpentine, or at contact with it and other rocks, have been found small quantities of rich copper ores and some small deposits of chrome iron. Through the slates and schists of the valley have been intruded numerous dikes of peculiar character. They are usually finely granular, light gray, with many scales of a light green color. They weather brown on exposure, and are sometimes found much decayed. They occur independently, and usually strike parallel with the inclosing formation. The gold-bearing quartz is associated with these dikes, the quartz replacing a greater or less portion of the dike rock itself. In some places silica has almost entirely replaced the dike rock, and in others, little or no vein quartz is found. The veins range

from a few inches to 20′, and the ore-shoots are long. The veins mostly dip E., but in some cases dip W. (see Dean Mine), and in others the vein is perpendicular (see Morning Star Mine). Throughout the entire length of this gold belt the work in depth, thus far done on the mines, has shown the veins to be faulted. It is probable that when the conditions which govern these faults are better understood, by reason of more extensive development, they will be considered no particular detriment to successful mining operations. Observations thus far made lead to the belief that the faults are of the reverse type, known as thrusts.

*San Antonio Mine* (Quartz).—See Lindsey.

*Santa Ana* (*Pierano*) *Mine* (Quartz).—It is 2 miles S. of Angels, on Albany Flat. A new shaft has reached a depth of 100′. The vein in diabase is 2′ wide. Twelve men are employed. H. C. Woodrow, of Angels, owner.

*Santa Cruz Mine* (Quartz).—See Calaveras Consolidated.

*Shaw Mine* (Drift).—It is on Golden Gate Ridge, ½ mile W. of North Branch. Idle. Phœnix Milling Co., of Sacramento, owner; John Shaw, of North Branch, superintendent.

*Shaw Mine* (Quartz).—It is 2½ miles N. of Murphy, and is opened by two cross-cut tunnels. No machinery. The owners are developing the mine. Two men are employed. Alfred Shaw et al., of Murphy, owners.

*Sheepranch Mine* (Quartz).—See our VIIth and XIth Reports, pp. 131 and 175. It is at Sheepranch, 12 miles N.E. of San Andreas. Closed down in 1894, and has since remained idle. The old workings, 1,200′ deep, are flooded to within 300′ of the surface—the level of a tunnel driven in from O'Neal's Creek, though not connected with the workings; but it is apparent that this tunnel has drained the mine to this level. J. B. Haggin et al., of New York, owners; W. H. Cleary, of Sheepranch, superintendent.

*Shenandoah Mine* (Quartz).—See our XIth and XIIth Reports, pp. 176 and 96. It is 2½ miles N.W. of El Dorado, and on the north side of Jesus Maria Creek. It is being prospected. Six men are employed. Shenandoah Mining Co., of Oakland, owner; William Nixon, of Mountain Ranch, superintendent.

*Shephard Mine* (Drift).—See Banner Blue Gravel.

*Sheridan Mine* (Quartz).—See our XIIth Report, p. 97. It is ¼ mile below Robinson's. The main adit is 100′ long. Thomas Richards, of Sonora, Tuolumne County, owner.

*Silver Mountain Mine* (Quartz).—It is 5 miles S.E. of West Point, between the South and Licking forks of the Mokelumne River. The rock mass upon which this claim is located is a trachytic tuff, and apparently a remnant of the volcanic capping of the gravel channels found in the vicinity. It is claimed by the owners that this material contains both gold and silver. C. E. Congdon et al., of Railroad Flat, owners.

*Single Standard Mine* (Quartz).—It is 2 miles W. of Murphy, and is a small vein opened by cuts and shafts, 10′ to 55′ deep. Several pockets have been found in these surface workings. James McQuigg, of Murphy, owner.

*Slate Creek Mine* (Quartz).—It is 4 miles S. of Valley Springs. It has a 2′ vein of gold-bearing quartz, which is being developed by shaft

and tunnel. Four men are employed. Chieland & Caldwell, of Valley Springs, owners.

*Sloane & Rudorff Mine* (Drift).—It is 2½ miles S. of Vallecito. Worked during winter and spring months. Sloane & Rudorff, of Vallecito, owners.

*Smyth Mine* (Quartz).—It is on Red Hill, ¼ mile W. of Vallecito, and has a tunnel 300′ long. Chas. D. Smyth, of Angels, owner.

*Smyth Mine* (Quartz).—See Brown, Smyth, and Ryland.

*South Carolina Mine* (Quartz).—It is on the southern slope of Carson Hill, 5 miles S. of Angels. A great mass of ankerite and mariposite, upward of 100′ wide, courses through the property, and in it are found great vein-like sheets of quartz. The developments consist of several tunnels, with cross-cuts. A new tunnel has been commenced near the base of the mountain, which is being driven to reach a point under the shoots exposed in workings higher up the mountain. Ten men are employed.

*South Paloma Mine* (Quartz).—It is the first south extension of the Gwin Mine. A shaft, 165′ deep, has been sunk, and intersected at 65′ depth by a tunnel. Drifting N. and S. on a small but gold-bearing vein has been commenced on the 150′ level. The walls are black slate, similar to the Gwin, and assumed to be on the same vein as the latter. The strike at the shaft is N. 17° W. Arrangements have been made to sink the shaft to 800′ in depth with a steam hoist. Twelve men are employed. South Paloma Mining Co., of San Francisco, owner; Mark B. Kerr, of Gwinmine, superintendent.

*Sparks Mine* (Drift).—It is 4 miles S.E. of Mokelumne Hill, on the Old Woman's Gulch channel. J. B. Sparks, of Campo Seco, owner.

*Spring Gulch Mine* (Placer).—See our XIIth Report, p. 97. It is 3 miles N. of San Andreas. Idle. J. S. White & Co., of San Andreas, owners.

*Spring Gulch Mine* (Quartz).—It is a prospect near Chaparral Hill, 3 miles S. of Angels. Thomas Smith et al., of Angels, owners.

*Stanislaus Mine* (Quartz).—See Melones Consolidated.

*Star of India* (*Curtis*) *Mines* (Quartz).—See our XIIth Report, p. 97. They are 2 miles W. of Angels, and on the west side of Smith's Flat. The group comprises three claims, in one of which a tunnel has been driven 360′, cutting a mass of quartz 40′ wide. At other points two shafts have been sunk 50′ on a vein 5′ to 6′ wide. Idle. Joseph F. Curtis, of Angels, owner.

*Stars and Stripes Mine* (Quartz).—It is on the Williams ranch, 2½ miles N.E. of Milton. A shaft was sunk years ago for copper. The rock also contains gold. N. Owens, of Milton, owner.

*Starlight Mine* (Quartz).—It is 8 miles E. of San Andreas. A shaft has been sunk 145′ on a 3′ vein of gold-bearing quartz. It has a steam hoist and a 5-stamp mill. Idle in 1895, pending the settlement of some disagreement between the owner and parties who had bonded the mine. W. B. Swank, of Mountain Ranch, owner.

*Stickle Mine* (Quartz).—See Utica-Stickle.

*Stonewall Mine* (Quartz).—It is 2½ miles S.W. of Murphy, and is a small vein, accompanied by a dike in mica schist. It has been prospected for a thousand feet by superficial workings, the deepest of which is a 55′ shaft. A tunnel has been run 360′ on the crevice, to reach a rich shoot. Two men are employed. Geo. Taylor, of Murphy, owner.

*Stony Gulch Mine* (Placer).—It is 3½ miles N.W. of Milton. Worked during winter months. U. G. Findley and M. L. Hunt, of Milton, owners.

*Suffolk Mine* (Quartz).—See Brown, Smyth, and Ryland.

*Suffolk Mine* (Quartz).—See our XIIth Report, p. 97. It is 4½ miles S.E. of Angels, and has only superficial development. Isaac Copeland, of Vallecito, owner.

*Thorp Mine* (Quartz).—See our Xth Report, p. 63. It is 5 miles S. of San Andreas, near Fourth Crossing P. O., and is an old mine being rehabilitated. A new inclined shaft has been sunk 500′ on a 55° angle, and furnished with a steam hoist. At the bottom a cross-cut has been run 60′ W., and drifts 40′ S. and 35′ N. The vein formation is 20′ wide. A large tank has been built at the 300′ station to take up surface water. The water is raised from the bottom by a Cornish pump. Eighteen men are employed. Thorp Mining Co., of San Francisco, owner; L. Allegewahr, of Fourth Crossing, superintendent.

*Tilford Mine* (Quartz).—It is a prospect on the Tilford ranch, 7 miles N.E. of Milton. A small cut has been made in a large quartz cropping, which prospects in gold. — Tilford, of Milton, owner.

*Total Wreck Mine* (Quartz).—It is 1 mile W. of Murphy. Idle. Colin Cambell, of Murphy, owner.

*Treat Mine* (Hydraulic).—It is ½ mile N.W. of Sheepranch (Cave City). Worked extensively many years ago. The tailings are now being rewashed. Geo. Treat, of San Andreas, owner.

*Tripp Mine* (Quartz).—See Garner Consolidated.

*Tryon Mine* (Quartz).—It is ¼ mile S. of Angels, adjoining the Last Chance on the south. A 226′ tunnel has been driven on the vein. C. W. Tryon, of Angels, owner.

*Tulloch Mine* (Quartz).—See our XIIth Report, p. 98. It is 2½ miles S. of Angels, on Albany Flat. The shaft is 150′ deep. Considerable development was done in 1895, and a new hoisting plant built, but the property is now idle. Louis Tulloch, of Angels, owner.

*Turner Mine* (Quartz).—See Angel's Camp.

*Union Shaft Mine* (Drift).—It is on Central Hill, 4 miles W. of San Andreas. Ira H. Reed, of San Andreas, owner.

*Uno Mine* (Quartz).—See Empire Consolidated.

*Uptograph* (*Buckminster*) *Mine* (Drift).—See our XIIth Report, p. 99. It is at Douglas Flat, on the Central Hill channel. Was worked for a while in 1893 by an Eastern company. The mine was then transferred to the workmen in settlement of their claims, and under their management it is reported to be paying handsomely. Five men are employed. John Black et al., of Douglas Flat, owners.

*Utica-Stickle Mine* (Quartz).—See our VIth (Part II), VIIIth, Xth, and XIIth Reports, pp. 28, 122–124, 150, and 98. It is situated in the town of Angels, and comprises two claims operated as a single mine under one management. Since our last Report several long levels and cross-cuts have been made, and a winze has been sunk 200′ below the 1,000′ level, at a point some distance south of the Stickle shaft, making the lowest level 1,200′ in September, 1895. This winze was sunk by means of compressed air, a double reversible hoist of improved pattern having been placed in a station at the 1,000′ level. The winze is inclined, and when timbered will be 5′ x 14′ in the clear, having two compartments. The cross-cuts are all large headings, 15′ to

20′ wide and 12′ to 15′ high, and answer a double purpose: prospecting the mine and supplying a large amount of waste for filling the large stopes. The south shaft of the Utica has been connected by an upraise with the 1,000′ level of the Stickle. The north shaft of the Utica remains at the same depth—560′—it has been for several years. The more extensive opening of this mine only tends to confirm what was said in our last Report concerning the geological structure of the ore-bodies and their relations to the inclosing rocks. One important fact, however, was omitted, for lack of sufficient corroborative evidence, viz.: that the amphibolite schist (altered diabase) which, together with the quartz, forms the pay-shoots of this mine, has been intruded by a peculiar grayish-brown dike of granular texture. It is usually found to contain an intricate network of veinlets of quartz and calcite, and is always highly silicious and generally abundantly impregnated with auriferous pyrite. With a few exceptions this rock is always found accompanying the pay zone, forming a portion of it. Indeed, it appears to form a very large portion of some of the principal shoots, which in places are over 100′ wide. In July, 1895, a fire occurred between the 800′ and 900′ levels of the Stickle Mine. A strong draught through the open workings caused the fire to spread with great rapidity, and, as it soon became evident that no ordinary means would extinguish the flames, the shafts were all tightly bulkheaded and the entire available water-supply (1,200 miner's inches, equivalent to nearly 20,000,000 gals. in twenty-four hours) was turned into the mine. For ninety hours this cataract fell into the workings, the water running down through loosely filled ground, the site of a cave which occurred some years previous. By this means the fire was extinguished. The work of unwatering the great stopes then began. Night and day for eight weeks the skips and pumps (regular and extra) were kept constantly employed. The actual damage by fire was confined to a small stope in which it started, and the damage from water was not nearly as great as had been anticipated. In 1895 three hundred and seventy men were employed. In August, 1896, this mine was revisited, but the superintendent refused all information. Utica Mining Co., of Angels, owner; Theodore Allen, of Angels, superintendent.

*Vallecito Consolidated Mines* (Drift and Hydraulic).—See our XIIth Report, pp. 99 and 482. This property is at and near the village of Vallecito. Since our last Report, work on the company's ditch has progressed somewhat, and additional property has been acquired for both mining and dumping ground. Vallecito Consolidated Mining Co., of San Francisco, owner; Isaac Copeland, of Vallecito, superintendent.

*Vanderbilt Mine* (Quartz).—It is 3½ miles S. of Angels, on the south slope of Chaparral Hill. A tunnel has been run 200′ on the vein. Idle. E. K. Stevenot, of Sonoma, owner.

*Washington Mine* (Quartz).—It is 5½ miles N. of Murphy. Idle and dismantled. C. V. Compere, of Murphy, owner.

*Washington Ranch Mine* (Quartz).—It is 6 miles N. of Murphy. Shaft 200′ deep. Idle. Joseph Latora, of Murphy, owner.

*Water Lily Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 141 and 90. It is 1 mile N.E. of West Point. Worked by tributers. M. Porter, of San José, Santa Clara County, owner.

*West Point District.*—See our XIIth Report, p. 99. There are a great many claims in this district, but not more than half a dozen were in operation in fall of 1895.

*Wheelock Mine* (Quartz).—It is ½ mile S.E. of Sheepranch. A tunnel and some surface cuts expose a vein 1′ to 6′ wide. The quartz is worked in arrastras.

*White Oak Mine* (Quartz).—It is at Smith's Flat, 1½ miles W. of Angels. It has a tunnel driven 100′ on a banded quartz vein, which contains gold and auriferous pyrite. The croppings may be traced several hundred feet. Three men are employed. Mercer & Gilman, of Angels, owners.

*White Pine Mine* (Quartz).—See Yellow Pine.

*Whittle Mine* (Quartz).—It is 4 miles S. of Angels, near Carson Creek. The shaft is caved and the machinery removed. Solinsky, Reddick, et al., of San Andreas, owners.

*Wiley Mine* (Quartz).—See Leonard.

*Willard Mine* (Quartz).—See Oro y Plata.

*Williams Mine* (Drift).—It is 3 miles S.E. of Mokelumne Hill, on Old Woman's Gulch channel. It is being worked steadily. Four men are employed. John Williams, of Mokelumne Hill, owner.

*Woodstock Mine* (Quartz).—See Mount Ophir.

*Yellow Pine* (*White Pine*) *Mine* (Quartz).—It is 3 miles N.E. of Milton. The ore-shoot occurs in altered diabase. Great fissures course through the rocks, and between these the gold and auriferous pyrite have been deposited. Some years ago a corporation built a mill and worked the mine, but unsuccessfully. J. E. Findly and Edward Vancel, of Milton, owners.

*Yellowstone Mine* (Quartz).—See our XIth Report, p. 173. It is at the upper end of Smith's Flat, and has been idle for a long time. Chas. D. Smyth, of Angels, owner.

*Young America Mine* (Quartz).—It is 2½ miles N.W. of Murphy, near San Domingo Creek. It has a tunnel 100′ long, which exposes two short shoots of ore, containing 5% of sulphurets. Dora Mining Co., of San Francisco, owner.

*Zacatera Mine* (Quartz).—It is 3 miles N.E. of West Point, and said to have been successfully operated years ago. The shaft, 600′ deep, is caved. The long cross-cut tunnel is being reopened. The formation is granite. Porteous & Field, of West Point, owners.

## MILLS IN CALAVERAS COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Altaville | | 8 | 700 | | | | | | | |
| Banner Blue Gravel | | 4 | 500 | 30 | | | | | | |
| Beatrice | | 10 | 850 | | | | | | | |
| Benson | | 3 | 800 | 35 | | | | | | |
| Birney | | 5 | 750 | 12 | 2 | Tulloch | | | | |
| Bisbee | | 5 | 400 | 8 | 1 | Tulloch | | | | |
| Blair Consolidated | | 10 | 850 | | | | | | | |
| Blazing Star | | 5 | 850 | 6-7 | 1 | Frue | | | | |
| Brown, Smyth, and Ryland | | 10 | 850 | | | | | | | |
| Calaveras Consolidated | | 20 | 850 | 60 | | | | | | |
| Carson Creek | | 40 | 650 | 70 | 8 | Tulloch | | | | |
| Dean | | 2 | 200 | 2 | | | | | | |
| Donnelan | | 5 | 850 | | | | | | | |
| Dora | | 5 | 900 | 12½ | 1 | Woodbury | | | | |
| Dunlap | | 2 | 400 | 3 | | | | | | |
| El Encino | | 10 | 850 | 100 | | | | | | |
| Empire Group | | 5 | 850 | 13 | | | | | | |
| Esmeralda | | 10 | 750 | | | | | | | |
| Esperanza | | 20 | 800 | 50 | 6 | Frue | | | | No data. |
| Eureka | | 5 | 850 | 10 | | | | | | |
| Fellowcraft | | 10 | 850 | (Formerly | on | Leonard.) | | | | |
| Garner Consolidated | | 10 | 850 | 30 | | | | | | |
| Gold Cliff | | 20 | 800 | 80 | 8 | Frue | | | | |
| Gold Hill | | 10 | 850 | 60 | | | | | | |
| Green Mountain | | 8 | 700 | 120 | | | | | | |
| Ilex | S. & W. | 40 | 850 | 80 | | | | | | |
| Lamphyre | | 12 | 700 | | | | | | | |
| Linderaxa | | 10 | 1,000 | 25 | | | | | | |
| Lockwood | | 5 | 800 | 8 | 2 | Frue | | | | |
| Lone Star | | 10 | 850 | | | | | | | |
| Lone Star | | 20 | 850 | | | | | | | |
| Louisa | | 10 | 850 | | | | | | | |
| Lucky Tom | | 5 | 900 | 60 | | | | | | |
| Madison | | 40 | 850 | 140 | 12<br>1 | Frue<br>U. I. Wks. | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maltman | | 1 | | | | | | | | |
| McCreight | Water | 10 | 650 | 12 | | | | | | |
| Meteor | | 2 | 420 | 2 | | | | | | |
| Old Calaveras | (Idle and gone to decay.) | | | | | | | | | |
| Oro y Plata | (Mostly removed.) | | | | | | | | | |
| Quartz Glen | | 20 | 850 | 60 | | | | | | |
| Rathgeb-Union | | 40 | 800 | | | | | | | |
| Reserve | | 40 | 650 | | | | | | | |
| Roanoke | | 8 | 750 | 20 | | | | | | |
| Rose Hill | | 10 | 800 | | | | | | | |
| Royal | | 10 | 850 | 25 | 2 | Frue | | | | |
| Russell Reduction and Mining Co. | S. & W. | 5 | 850 | 7½ | | | | | | |
| Shaw | | 5 | | 60 | | | | | | |
| Sheepranch | | 20 | 850 | 40 | | | | | | |
| Shenandoah | | 10 | 850 | 20 | | | | | | |
| Starlight | | 5 | 850 | 12 | 2 | Tulloch | | | | |
| Stickle | | 60 | 850 | 240 | 1<br>24 | Tulloch<br>Frue | | | | |
| Suffolk | Water | 5 | 600 | 10 | | | | | | |
| Utica | | 60 | 850 | 240 | 24 | Frue | 6 | 4 tons. | | 6,500 sq. ft. |

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN CALAVERAS COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Angels | Water | 3 | Low | | 50 | | | | | | |
| Buena Vista | | 1 | Kendall | | | | | | | | |
| Maltman Reduction Works | Steam | 1 | Tustin | | 2½ | | | | | | |
| New York | | | Rocker | | 10 | | | | | | |
| Plymouth Rock | | 2 | Huntington | | 25 | 2 | Frue | 1 | | | No data. |
| Quaker City | Water | 1 | Huntington | 6 ft. | 15–20 | | | | | | |
| Russell Reduction and Mining Co. | S. & W. | 1 | Dodge | | 7½ | | | | | | |
| Alameda | | | Arrastra | | 1 | | | | | | |
| Carlton | | | Arrastra | | ½ | | | | | | |
| Dalmazia | | | Arrastra | | 1 | | | | | | |
| Wheelock | | | Arrastra | | | | | | | | |

## Colusa County.

Though agriculture and stock-raising are the principal industries, a part of the county's revenue is derived from mineral resources. Grain growing is paramount in that part of the county which lies in the Sacramento Valley, and grazing lands prevail through the mountainous regions of the western part. Its known economic mineral resources consist of gold, mineral waters, petroleum, quicksilver, and sandstone copper and sulphur are said to have been produced some years ago, but their exploitation was not remunerative.

*Clyde Mine* (Quartz).—See our XIth Report, p. 183. It is in the Sulphur Creek District, in the S.E. ¼ of Sec. 12, T. 14 N., R. 6 W., at about 3,200′ elevation. It has been worked by a shaft and tunnels, now considerably caved. Good ore is said to have been mined. It is said work is soon to be resumed. Andrew James, of Sulphur Creek, superintendent.

*Keely Mine* (Quartz).—See our XIth Report, p. 184. It is immediately S.E. of, and adjoins the Clyde Mine; it consists of surface workings only. Idle. J. W. Brim, of Williams, owner.

*Manzanita Gold Mining Co.'s Mine* (Quartz).—See our XIth Report p. 194. It is on the north side of Sulphur Creek, in the N.E. ¼ of Sec. 29, T. 14 N., R. 5 W., at about 1,900′ elevation, and consists of three patented claims of 85.85 acres. The ore occurs in thin seams in a broad belt of arenaceous shale, which strikes W. of N. The disseminated ore seams run in all directions, and necessitate mining the intervening country rock. The ore is for the most part sulphurets of iron, and the concentrates are said to carry a high percentage of gold. The workings consist of three large irregular shallow cuts and eight tunnels, 60′ to 130′ long. The plant consists of a Gates crusher, three 5′ Huntington mills, six Victor and two McGlew concentrators, three 5′ amalgamating pans, two 8′ settlers, a 65 H.P. engine and boiler (not in use), and a 35 H.P. Otto gasoline-engine. By using gasoline, from $1 to $2 and the salary of an engineer are said to be saved daily. The mill is run intermittently; 3 miners, 4 millmen, and 3 roustabouts are employed. George W. Northey, of Sulphur Creek, superintendent.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN COLUSA COUNTY.

| Name of Mill or Mine. | Number. | Character. | Diameter. | Concentrators. | |
|---|---|---|---|---|---|
| | | | | No. | Character. |
| Clyde | 1 | Huntington | 5′ | | |
| Manzanita | 3 | Huntington | 5′ | {6<br>{2 | Victor<br>McGlew |

## Del Norte County.

The principal exports of the county consist of redwood lumber, shingles, boxes, cattle, hogs, and butter. The redwood forest extends along the coast, 5 to 10 miles wide, and will, at the present rate of cutting, supply the markets for many years. A railroad from Smith River

orners to Crescent City, with several short branches, takes the logs to ıe mill and the lumber to the wharf. A steamer calls there every week : ten days. Dairying is extensively carried on along the coast; the vergreen hills furnish excellent pasturage for cattle, and are used xclusively for that purpose. The copper deposits at Low Divide, and ıe extensive gravel beds at French Hill, Haynes, and Big Flat, are of reat value. They will no doubt be worked to their utmost capacity in ıe immediate future and furnish employment to many men.

*Bartlett Mine* (Quartz).—It lies on the north side of Preston Peak, ear the east line of the county. There are four locations on a strong ein. The developments consist of shallow surface cuts, and the ore ırries a high percentage of sulphurets of iron and copper. Idle. John oung, of Crescent City, and Green Bartlett, of Waldo, Or., owners.

*Baumgarten Mine* (Placer).—It is at Big Flat, 25 miles S.E. of Cres- ent City, and contains 160 acres, at 2,100′ elevation. Worked by round-sluicing. Water is taken from several small gulches. Charles aumgarten, of Crescent City, owner.

*Big Flat Mine* (Hydraulic).—See our XIth and XIIth Reports, pp. 96 and 100. It lies on the ridge between Hurdy Gurdy and Janes reeks, 25 miles S.E. of Crescent City, at 2,160′ altitude. The property ontains 240 acres. After lying idle for a number of years the present wners organized a company, and, in 1895, were thoroughly equipping . The water is taken from Janes Creek, through a $3\frac{1}{2}'$ x $2\frac{1}{2}'$ ditch, 6 iles long, with a grade of 12′ per mile. A water-power sawmill, with 0″ saw, furnishes the necessary lumber; 1,300′ of 13″ pipe, two No. 4 iants, and 24″ wide sluice-boxes were on the ground. Janes Creek illing, Mining, and Irrigating Co., owner; John McLaughlin, of Cres- ent City, manager.

*Burrows and Peak Mine* (Placer).—It lies on the Middle Fork of mith River, 17 miles E. of Gasquet, and contains 60 acres, at 2,550′ ltitude. This is a recent location, and a 2′x 2′ ditch, $\frac{1}{2}$ mile long, is ow being dug. Burrows & Peak, of Gasquet, owners.

*Butler Mine* (Placer).—It lies on the French Hill channel, 3 miles S. f Gasquet, and contains 20 acres, at 2,100′ altitude. Water is taken rom small gulches by a ditch, and collected in a reservoir. Worked by round-sluicing. James Butler, of Gasquet, owner.

*Casey Mine* (Placer).—It is on Myrtle Creek, 7 miles W. of Gasquet, nd contains 40 acres, at 820′ altitude. A 2′x 1′ ditch, $\frac{3}{4}$ mile long, from Myrtle Creek, furnishes water for ground-sluicing. Casey & Moore, of Gasquet, owners.

*Cleary Mine* (Placer).—It lies on the French Hill channel, 3 miles S. f Gasquet, and contains 20 acres, at 2,160′ altitude. Water for ground- luicing is collected from several small gulches. Lawrence Cleary, of Gasquet, owner.

*Christensen Mine* (Hydraulic).—It lies at the mouth of the South Fork of Smith River, 10 miles S.E. of Crescent City, and contains 160 acres, at 300′ altitude. Water is taken from Sheep Pen Gulch by a 2′x 2′ ditch, $\frac{1}{2}$ mile long; 180′ of 7″ hose delivers the water through a $2\frac{1}{4}$″ nozzle under 60′ pressure. The bank is 20′ high and all gravel. The bedrock is serpentine. The sluices are 20″ wide and are paved with block riffles. Nels. Christensen, of Gasquet, owner.

*Coleman Mine* (Placer).—It is on Monkey Creek, 15 miles E. of Gas- quet, and contains 160 acres, at 2,570′ altitude. Water for ground-

sluicing is taken from Temple Gulch through a 2½'x 2' ditch, 2 mile long. The bank of gravel is 10' high. Coleman & Haight, of Gasque owners.

*Cooke Mine* (Hydraulic).—It lies on Smith River, 3 miles below Gas quet, and contains 80 acres, at 550' altitude. Water for ground-sluicin is collected from small creeks by a 3'x 2' ditch, 2 miles long. A ne 3'x 2' ditch, 2 miles long, was, in 1895, being dug from Cooke's Creek to work the claim by the hydraulic method. There are 500' of 11 pipe, and a No. 3 giant, under 75' pressure. The sluices are 24" wide The serpentine bedrock lies 150' above the river. George Cooke, o Gasquet, owner.

*Coon Flat Mine* (Placer).—See our XIth Report, p. 197. It lies o Coon Ridge, 8 miles S. of Gasquet, and contains 100 acres, at 2,100 altitude. Water is taken from Coon Creek, through a 3'x 2' ditch, miles long. The bank of gravel is 10' to 50' deep, and seems to be defined channel. It is intended to use a pipe and giant this (1895–96 winter. Now worked by ground-sluicing. Coon Mountain Mining Co. owner; Charles Goodridge, of Crescent City, superintendent.

*Crescent City* (*Yates*) *Mine* (Beach).—See our XIIth Report, p. 100 It lies on the beach, 3 miles S. of Crescent City, and contains 42 acres Some years ago an attempt was made to separate the black sand afte saving the *free gold*, as it is said to contain $3 of gold per ton. Th *modus operandi* was kept secret, but it is supposed that soft iron mag nets, excited by electricity, were used. The property is bonded t parties who intend to revive this old process. The plant is still on th ground. The beach sand is worked down 12', or to water-level. On quarter ounce of platinum per day was saved with the gold. Ed. Yates of Crescent City, owner.

*Estman Mine* (Placer).—It is on Siskiyou Fork, 20 miles E. of Gas quet, and contains 40 acres, at 2,760' altitude. Worked with rockers Frank Estman et al., of Gasquet, owners.

*Frank Mine* (Placer).—It lies on the French Hill channel, 3 miles S of Gasquet, and contains 20 acres, at 2,175' altitude. Water is collected from small creeks. Worked by ground-sluicing. Antone Frank, o Gasquet, owner.

*French Hill Mine* (Hydraulic).—It lies on French Hill, 3 miles S of Gasquet, and contains 383 acres, at 2,200' elevation. Water is taken from Coon and Thompson creeks, by a 4'x 3' ditch, 9 miles long, built on a grade of 10' per mile. There are 1,200' of 14" pipe and a No. 4 giant on the ground. The mine lies on a channel, 800' to 1,000' wide, filled with slightly cemented gravel 10' to 20' deep. A bed of pipe-clay shows in the face. The channel runs along the top of French Hill in a southwesterly direction, and it is possible that the channels at Coon Ridge and Hayne's Flat are a continuation of it. The mine has been idle several years, but it is intended to start up this (1895–96) winter. French Hill Water and Mining Co., owner; L. S. Cooper, of Crescent City, secretary and manager.

*Garrison Mine* (Placer).—It lies on Bald Hill, 12 miles S.E. from Crescent City, and contains 20 acres, at 2,100' altitude. Water is collected from small gulches, and the claim is worked by ground-sluicing. Will Garrison, of Crescent City, owner.

*Hayne's Flat Mine* (Hydraulic).—It lies on the ridge between Coon and Garden creeks, 20 miles S.E. of Crescent City, and contains 160

res, at 2,050′ altitude. Water is taken by two 5′x 2′ ditches from on and Garden creeks, 7 and 3 miles long, respectively. The latter ns through a tunnel 1,300′ long. There are 1,500′ of 13″ pipe and a o. 3 giant on the claim. The sluices are 36″ wide and paved with ock riffles. The channel is well defined, 100′ wide, 150′ deep, and runs W. Near the bottom lies 15′ to 30′ of blue gravel, carrying coarse gold; xt comes about 20′ of black gravel, cemented with iron; then red gravel the surface. The bedrock is serpentine. To continue work it is nec- sary to cut 800′ of tunnel for the waste through a dike 150′ high, which ns across the channel at the southwestern end. Idle. Ed. Yates, of rescent City, owner.

*Hueniche Mine* (Placer).—This is on Craig's Creek, 8 miles S.W. of asquet, and contains 60 acres, at 260′ altitude. The claim lies on a bar the creek-bed. Bedrock lies 4′ below the water-level, and the gravel is out 8′ deep. The owner is constructing a tail-race, blasting out structions near the mouth of the creek to get the necessary fall. Ben ueniche, of Crescent City, owner.

*Kaus Mine* (Hydraulic).—It is on Craig's Creek, 8 miles S.W. of asquet, and contains 60 acres, at 340′ elevation. Water is obtained om Craig's Creek by a 3′x 2′ ditch, and delivered through 100′ of 6″ pe and 100′ of 7″ hose to a 2″ nozzle under 40′ pressure. The bank is 5′ to 30′ high, and shows 8′ to 12′ of gravel. The sluices are 20″ wide. ntone Kaus, of Gasquet, owner.

*Kelly Mine* (Placer).—It lies on Smith River, at the mouth of Patrick's ulch, 9 miles E. of Gasquet, and contains 20 acres, at 920′ altitude. Vater for ground-sluicing is taken from a small gulch. Pat Kelly, of asquet, owner.

*Lambert Mine* (Placer).—It is at Big Flat, 25 miles S.E. of Crescent ity, and contains 20 acres, at 2,100′ elevation. Water for ground-sluicing obtained from small gulches. John Lambert, of Crescent City, owner.

*Larsen Mine* (Placer).—It is on an old bar of Myrtle Creek, 7 miles . of Gasquet, and contains 20 acres, at 760′ altitude. Water for ground- uicing is taken from Cook's Gulch by a ditch ½ mile long. Charles arsen, of Gasquet, owner.

*Mayne Mine* (Placer).—It is at Big Flat, 25 miles S.E. of Crescent ity, and contains 20 acres, at 2,100′ altitude. Water for ground-sluicing obtained from small gulches. John Mayne, of Crescent City, owner.

*Myrtle Creek Mine* (Placer).—See Waganer.

*Oranna (Crescent City) Mine* (Quartz).—See our Xth and XIth Re- orts, pp. 167 and 197. It is on Bald Hill, 12 miles S.E. of Crescent ity. The vein is 1′ to 4′ wide, courses N.E. and S.W., and dips N., etween metamorphic slate and serpentine. There is a 150′ tunnel and 75′ incline. Idle since 1890. Ed. Yates et al., of Crescent City, owners.

*Rice Mine* (Placer).—See our XIth Report, p. 196. It lies on Mill reek, 5 miles S.E. of Crescent City. Worked by ground-sluicing. H. ice, of Crescent City, owner.

*Rice & Murray Mine* (Hydraulic).—This is on the South Fork of mith River, 11 miles S.E. of Crescent City, and contains 40 acres, at 20′ elevation. This claim lies on the second bench of the river. Water brought from a small tributary through a 2′x 2′ ditch, 1 mile long, nd delivered through 150′ of 6″ pipe and 150′ of 7″ hose to a 2½″ nozzle, nder 50′ pressure. The bank is 25′ high and all gravel. Dan Rice, of rescent City, owner.

*Torrejon Mine* (Placer).—It lies in Redwood Gulch on the French Hill channel, and contains 20 acres, at 2,180′ altitude. Worked by ground-sluicing. José Torrejon, of Gasquet, owner.

*Waganer* (*Myrtle Creek*) *Mine* (Hydraulic).—See our XIth Report p. 195. This lies on Myrtle Creek, 7 miles W. of Gasquet, and contains 60 acres, at 370′ altitude. Water is taken from Myrtle Creek by a 2½′x 1½′ ditch; 100′ of 6″ pipe and 150′ of 7″ canvas hose deliver the water, under 60′ head, to a 2½″ nozzle. The bank is 20′ high and all gravel. Charles Waganer, of Gasquet, owner.

*Washington Mine* (Placer).—It is a recent location on Monkey Creek 15 miles E. of Gasquet, and contains 160 acres, at 2,620′ elevation. A 2′x 2′ ditch, 2 miles long, was, in 1895, being dug to convey water from Monkey Creek to the claim. George H. Washington, of Gasquet, owner.

*Whitney Mine* (Placer).—It lies on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,160′ altitude. Water for ground-sluicing is obtained from small gulches. George Whitney, of Gasquet, owner.

*Winsch Mine* (Hydraulic).—This is on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,200′ altitude. Water is brought from Bear Camp Gulch, by a 2′x 2′ ditch, 2½ miles long. There are 500′ of 11″ pipe and a No. 1 giant in use. Raymond Winsch, of Gasquet, owner.

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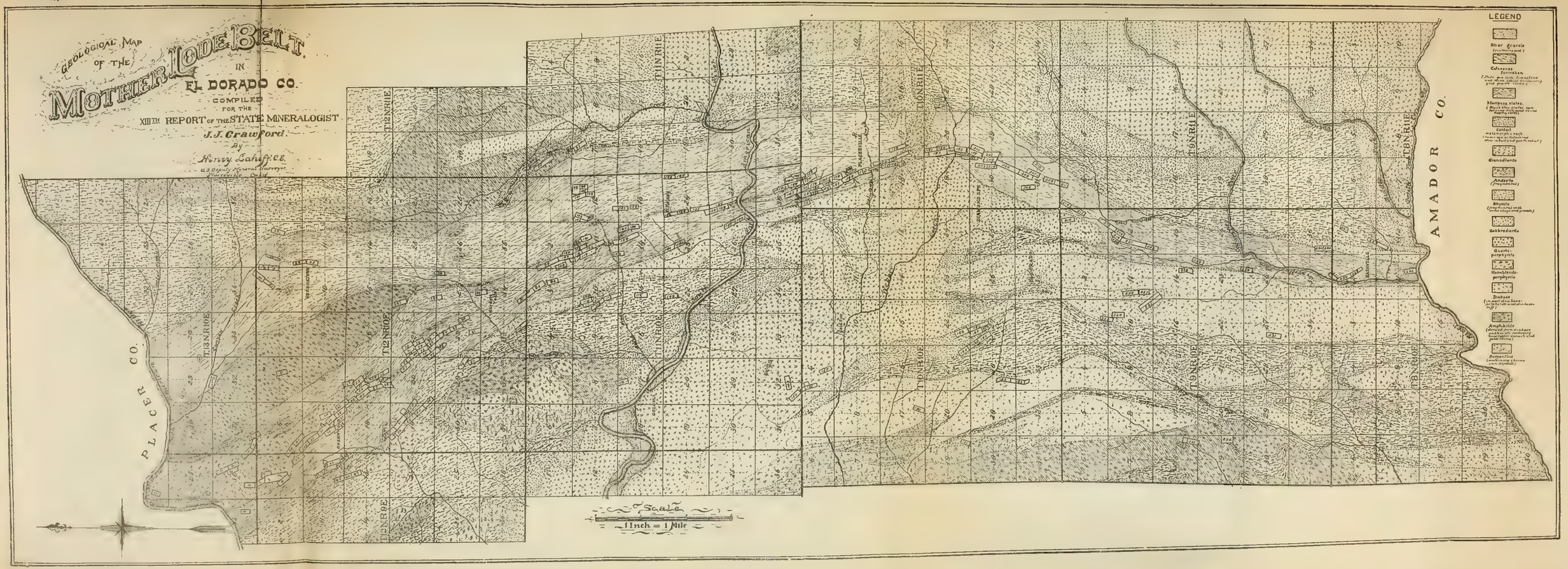


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# El Dorado County.

LIST OF MINES ON ACCOMPANYING MAP.

| No. | Name. | Sec. | T.N. | R.E. | No. | Name. | Sec. | T.N. | R.E. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Yellow Jacket | 1 | 13 | 10 | 71 | Potance | 21 | 12 | 10 |
| 2 | Saybert | 24 | 13 | 9 | 72 | Bessie | 21 | 12 | 10 |
| 3 | Sliger | 25 | 13 | 9 | 73 | Wheeler & Wilson | 21 | 12 | 10 |
| 4 | Golden State | 32 | 13 | 10 | 74 | Josh Billings | 21 | 12 | 10 |
| 5 | Blizzard | 36 | 13 | 9 | 75 | Rosecrans | 21 | 12 | 10 |
| 6 | Daisy | 36 | 13 | 9 | 76 | Wagner | 21 | 12 | 10 |
| 7 | Rough and Ready | 36 | 13 | 9 | 77 | Coloma Con. | 21 | 12 | 10 |
| 8 | Muntz | 35 | 13 | 9 | 78 | Croft | 28 | 12 | 10 |
| 9 | Cedarburg Ex. | 36 | 13 | 9 | 79 | Madrone | 29 | 12 | 10 |
| 10 | Railroad Hill | 31 | 13 | 10 | 80 | Buckeye | 29 | 12 | 10 |
| 11 | Belle | 31 | 13 | 10 | 81 | Ivanhoe | 28 | 12 | 10 |
| 12 | Golden Age | 31 | 13 | 10 | 82 | Emma | 21 | 12 | 10 |
| 13 | Cedarburg | 1 | 12 | 9 | 83 | Poor | 21 | 12 | 10 |
| 14 | Windy Hill | 1 | 12 | 9 | 84 | Lone Jack | 28 | 12 | 10 |
| 15 | Cedarburg G. M. Co. | 1 | 12 | 9 | 85 | Garden City | 28 | 12 | 10 |
| 16 | Atlantic and Pacific | 1 | 12 | 9 | 86 | Esperanza | 28 | 12 | 10 |
| 17 | Gallagher | 5 | 12 | 10 | 87 | Mt. Hope | 22 | 12 | 10 |
| 18 | Mameluke | 3 | 12 | 10 | 88 | Ben Franklin | 22 | 12 | 10 |
| 19 | Le Boeuf | 3 | 12 | 10 | 89 | Fairview | 27 | 12 | 10 |
| 20 | Modoc | 2 | 12 | 10 | 90 | Keystone | 27 | 12 | 10 |
| 21 | Van | 3 | 12 | 10 | 91 | Isabell | 34 | 12 | 10 |
| 22 | Plattsburgh | 2 | 12 | 10 | 92 | Isabell Ex. | 3 | 11 | 10 |
| 23 | Bright Hope | 2 | 12 | 10 | 93 | United | 3 | 11 | 10 |
| 24 | Keeler | 2 | 12 | 10 | 94 | N. St. Lawrence | 2 | 11 | 10 |
| 25 | Woodside | 11 | 12 | 10 | 95 | Blue Lead | 6 | 11 | 11 |
| 26 | Resurrection | 6 | 12 | 10 | 96 | Alhambra | 6 | 11 | 11 |
| 27 | San Martine | 6 | 12 | 10 | 97 | Atlantic | 7 | 11 | 11 |
| 28 | Bennett | 1 | 12 | 9 | 98 | Railroad | 12 | 11 | 10 |
| 29 | Lee | 7 | 12 | 10 | 99 | Crystal | 12 | 11 | 10 |
| 30 | Wolf | 7 | 12 | 10 | 100 | Washington | 12 | 11 | 10 |
| 31 | Welch | 7 | 12 | 10 | 101 | Harrison | 12 | 11 | 10 |
| 32 | Esperanza | 7 | 12 | 10 | 102 | Hope | 12 | 11 | 10 |
| 33 | Ohio | 7 | 12 | 10 | 103 | Old Judge | 12 | 11 | 10 |
| 34 | Albinos | 7 | 12 | 10 | 104 | Mary Ann | 12 | 11 | 10 |
| 35 | Bordt | 7 | 12 | 10 | 105 | Equinox | 12 | 11 | 10 |
| 36 | Flora | 7 | 12 | 10 | 106 | St. Louis | 2 | 11 | 10 |
| 37 | Eagle | 7 | 12 | 10 | 107 | St. Lawrence | 2 | 11 | 10 |
| 38 | Crockett | 7 | 12 | 10 | 108 | Gold Deposit | 2 | 11 | 10 |
| 39 | Spanish | 12 | 12 | 9 | 109 | Russian American | 10 | 11 | 10 |
| 40 | Union | 12 | 12 | 9 | 110 | United States | 10 | 11 | 10 |
| 41 | New Garibaldi | 12 | 12 | 9 | 111 | N. Ex. Rocky Bend | 10 | 11 | 10 |
| 42 | Oakland | 12 | 12 | 9 | 112 | Rocky Bend | 10 | 11 | 10 |
| 43 | Machine | 12 | 12 | 9 | 113 | Swansea | 10 | 11 | 10 |
| 44 | Greenwood | 12 | 12 | 9 | 114 | Last Chance | 17 | 11 | 10 |
| 45 | Lucky Marion | 12 | 12 | 9 | 115 | Shenandoah | 33 | 12 | 10 |
| 46 | Hickman | 13 | 12 | 9 | 116 | Caledonia | 15 | 11 | 10 |
| 47 | Occidental | 13 | 12 | 9 | 117 | Amazon | 11 | 11 | 10 |
| 48 | Eastern Star | 17 | 12 | 10 | 118 | St. Lawrence No. 2 | 11 | 11 | 10 |
| 49 | Wisconsin | 17 | 12 | 10 | 119 | Buckeye | 11 | 11 | 10 |
| 50 | Golden Egg | 17 | 12 | 10 | 120 | Cleveland | 11 | 11 | 10 |
| 51 | Vistula | 17 | 12 | 10 | 121 | Red Hill | 11 | 11 | 10 |
| 52 | Maltby | 17 | 12 | 10 | 122 | Guadalupe | 11 | 11 | 10 |
| 53 | Dahlonega | 17 | 12 | 10 | 123 | Rising Sun | 11 | 11 | 10 |
| 54 | Argonaut | 17 | 12 | 10 | 124 | Gopher Bowlder | 14 | 11 | 10 |
| 55 | Aultman | 17 | 12 | 10 | 125 | Young America | 14 | 11 | 10 |
| 56 | Longfellow | 17 | 12 | 10 | 126 | St. Clair | 14 | 11 | 10 |
| 57 | Gladness | 17 | 12 | 10 | 127 | Ida Livingstone | 13 | 11 | 10 |
| 58 | Idalene | 17 | 12 | 10 | 128 | Currie (Lady Emma) | 13 | 11 | 11 |
| 59 | Revenge Con. | 18 | 12 | 10 | 129 | North Star | 24 | 11 | 11 |
| 60 | Mineral Point | 19 | 12 | 12 | 130 | Big Chunk | 24 | 11 | 10 |
| 61 | Revenge Con. | 19 | 12 | 10 | 131 | Jennings | 20 | 11 | 10 |
| 62 | Transcendent | 19 | 12 | 10 | 132 | Wilfred | 20 | 11 | 10 |
| 63 | Venture | 19 | 12 | 10 | 133 | Gray Eagle | 24 | 11 | 10 |
| 64 | El Dorado | 19 | 12 | 10 | 134 | Big Sandy | 24 | 11 | 10 |
| 65 | Blue Lead | 19 | 12 | 10 | 135 | Kelsey Gold and Silver | 24 | 11 | 10 |
| 66 | Bullion | 20 | 12 | 10 | 136 | Peterson | 25 | 11 | 10 |
| 67 | Clydesdale | 20 | 12 | 10 | 137 | Kelsey Gold and Silver | 25 | 11 | 10 |
| 68 | N. Ex. Taylor | 20 | 12 | 10 | 138 | Old Hickory | 25 | 11 | 10 |
| 69 | Taylor (Idlewild) | 21 | 12 | 10 | 139 | Coleman | 26 | 11 | 10 |
| 70 | Julia | 21 | 12 | 10 | 140 | Berryman | 25 | 11 | 10 |

LIST OF MINES ON ACCOMPANYING MAP—Continued.

| No. | Name. | Sec. | T.N. | R.E. | No. | Name. | Sec. | T.N. | R.E. |
|---|---|---|---|---|---|---|---|---|---|
| 141 | Sthrale | 23 | 11 | 10 | 193 | Epley | 20 | 10 | 1 |
| 142 | Doty | 23 | 11 | 10 | 194 | Webber | 20 | 10 | 1 |
| 143 | Poverty Point | 36 | 11 | 10 | 195 | Ribbon Rock | 20 | 10 | 1 |
| 144 | Fortuna | 36 | 11 | 10 | 196 | Rattler | 20 | 10 | 1 |
| 145 | Estella | 36 | 11 | 10 | 197 | Cincinnati | 30 | 10 | 1 |
| 146 | McNeill | 36 | 11 | 10 | 198 | Keystone | 20 | 10 | 1 |
| 147 | Jackson | 36 | 11 | 10 | 199 | Superior | 29 | 10 | 1 |
| 148 | Barton | 32 | 11 | 10 | 200 | Marguerite | 29 | 10 | 1 |
| 149 | Merry Andrew | 22 | 11 | 10 | 201 | Larkin | 29 | 10 | 1 |
| 150 | Sylvester | 32 | 11 | 10 | 202 | Live Oak | 30 | 10 | 1 |
| 151 | Sylvester Ex. | 4 | 10 | 10 | 203 | Concordia | 30 | 10 | 1 |
| 152 | Webb | 4 | 10 | 10 | 204 | Champion | 30 | 10 | 1 |
| 153 | Lion | 6 | 10 | 11 | 205 | Griffith & Bryant | 30 | 10 | 1 |
| 154 | Eureka | 6 | 10 | 11 | 206 | Manzanita | 31 | 10 | 1 |
| 155 | Logan | 6 | 10 | 11 | 207 | Manzanita Queen | 31 | 10 | 1 |
| 156 | Gentle Annie | 6 | 10 | 11 | 208 | Schnieder & Co. | 31 | 10 | 1 |
| 157 | Independent | 6 | 10 | 11 | 209 | Lone Star | 31 | 10 | 1 |
| 158 | Bona Sorta | 6 | 10 | 11 | 210 | Oro Flem | 31 | 10 | 1 |
| 159 | Witmer | 6 | 10 | 11 | 211 | Lone Star Ex. | 6 | 9 | 1 |
| 160 | Sherman | 6 | 10 | 11 | 212 | Grand Victory | 33 | 10 | 1 |
| 161 | Gross No. 2 | 6 | 10 | 11 | 213 | Salisbury | 33 | 10 | 1 |
| 162 | Gross No. 1 | 6 | 10 | 11 | 214 | Minnesota | 6 | 9 | 1 |
| 163 | Van Hooker | 6 | 10 | 11 | 215 | Equator | 1 | 9 | 1 |
| 164 | Grant | 6 | 10 | 11 | 216 | Tullis | 1 | 9 | 1 |
| 165 | Wellington | 6 | 10 | 11 | 217 | Richelieu | 1 | 9 | 1 |
| 166 | Hallack | 6 | 10 | 11 | 218 | Golden Fleece | 12 | 9 | 1 |
| 167 | Old Harmon | 7 | 10 | 11 | 219 | El Dorado (Church) | 12 | 9 | 1 |
| 168 | Young Harmon | 7 | 10 | 11 | 220 | Vernon (Olds) | 12 | 9 | 1 |
| 169 | German | 7 | 10 | 11 | 221 | Springfield | 12 | 9 | 1 |
| 170 | Enterprise | 7 | 10 | 11 | 222 | Julia Beard | 12 | 9 | 1 |
| 171 | Davey | 7 | 10 | 11 | 223 | Independent | 3 | 9 | 1 |
| 172 | Keegan | 7 | 10 | 11 | 224 | Starlight | 10 | 9 | 1 |
| 173 | Chester | 7 | 10 | 11 | 225 | Pocahontas | 10 | 9 | 1 |
| 174 | Pacific | 18 | 10 | 11 | 226 | Lamville | 11 | 9 | 1 |
| 175 | Rose | 18 | 10 | 11 | 227 | Ophir | 11 | 9 | 1 |
| 176 | Ida | 18 | 10 | 11 | 228 | German | 14 | 9 | 1 |
| 177 | Maryland | 18 | 10 | 11 | 229 | Oakland | 14 | 9 | 1 |
| 178 | Atlantic | 17 | 10 | 11 | 230 | Vandergrift | 26 | 9 | 1 |
| 179 | Oregon | 18 | 10 | 11 | 231 | Monarch | 27 | 9 | 1 |
| 180 | Rudolph & Gillespie | 17 | 10 | 10 | 232 | Crystal | 18 | 9 | 1 |
| 181 | Eagle | 19 | 10 | 10 | 233 | Crystal Ex. | 18 | 9 | 1 |
| 182 | Eureka | 28 | 10 | 10 | 234 | Vandalia | 19 | 9 | 1 |
| 183 | Barnes | 33 | 10 | 10 | 235 | Big Cañon (Oro Fino) | 29 | 9 | 1 |
| 184 | Shaw | 21 | 10 | 10 | 236 | Montezuma | 29 | 9 | 1 |
| 185 | Little Giant | 27 | 10 | 10 | 237 | Montezuma | 2 | 8 | 1 |
| 186 | Liverpool | 27 | 10 | 10 | 238 | Nashville Quartz | 2 | 8 | 1 |
| 187 | Western Star | 27 | 10 | 10 | 239 | California Con. | 2 | 8 | 1 |
| 188 | Glines | 22 | 10 | 10 | 240 | McDowell & Wiltshire | 36 | 9 | 1 |
| 189 | Davidson | 27 | 10 | 10 | 241 | Central | 1 | 8 | 1 |
| 190 | Yellow Jacket | 21 | 10 | 11 | 242 | Nashville | 1 | 8 | 1 |
| 191 | Farraday | 20 | 10 | 11 | 243 | Lone Star | 11 | 8 | 1 |
| 192 | Henrietta | 20 | 10 | 11 | | | | | |

*Adams Gulch Mine* (Quartz).—See our XIIth Report, p. 101. It is 2 miles N. of Nashville, at 1,000′ elevation, and comprises 1,500′ by 600′. The vein strikes N. and S., between slate walls, and is 2′ wide. Idle. J. C. Heald, of Nashville, owner.

*Alpine* (*Union Consolidated*) *Mine.*—See our VIIIth Report, p. 167. It is 2½ miles S.W. from Georgetown. Idle.

*Argonaut Mine* (Quartz).—See our Xth Report, p. 176. It is about 1 mile E. of Greenwood. Idle.

*Armstrong & Roberts Mine* (Drift).—See our XIIth Report, p. 101. It is 3½ miles S. of Grizzly Flat. W. T. Armstrong et al., of Grizzly Flat, owners.

*Aultman Mine* (Quartz).—See our XIIth Report, p. 102. It is 2 miles E. of Greenwood, at 1,900′ elevation, and comprises 1,500′ by 600′ patented ground. Idle. J. Smith, of Greenwood, owner.

*Baldwin Mine* (Quartz).—See our XIIth Report, p. 102. It is 2 miles S. of Nashville, in T. 8 N., R. 10 E., at 1,300′ elevation. Idle. E. J. Baldwin, of San Francisco, owner.

*Baltic Mine* (Quartz).—It is 8 miles N.W. from Grizzly Flat, at 4,250′ elevation, and comprises four claims. The 12″ vein strikes N.E. and S.W., and dips 50° E., between slate walls; three of the claims are continuous on one vein. The quartz carries iron sulphurets. The developments consist of a 4′x 8′ shaft, 40′ deep, and a tunnel, 220′ long, with 60′ running on the vein to tap the shaft, which it will do in 70′ more. A 10-stamp mill is being built to replace a small "cannonball" mill, using water-power from Baltic Creek. Twelve men are employed. Baltic Mining and Milling Co., of Placerville, owner; L. M. Barnes, of Kelly Park, superintendent.

*Barnes Mine* (Quartz).—See Greenstone.

*Beattie & Parsons Consolidated Mine* (Seam Diggings).—See our XIth and XIIth Reports, pp. 203 and 102. It is 1½ miles N. of Georgetown, at 2,300′ elevation, and comprises 60 acres. Since our last Report the company has been notified to cease using a giant in its work. The company owns a water-right on Cañon Creek, and takes water through 3 miles of ditch, with a ⅜″ grade per rod, and having a capacity of 60 miner's inches, delivered under 40′ pressure. Four men are employed, sluicing. Beattie & Barklage, of Georgetown, owners.

*Benfeldt* (*Rogers*) *Mine* (Drift).—See our VIIIth and Xth Reports, p. 197 and 179. It is at Smith's Flat, 2 miles E. of Placerville. Employs 12 men. — Benfeldt, of Smith's Flat, owner.

*Bidstrup Mine* (Quartz).—It is in Logtown, at 1,950′ elevation. Idle. P. T. Bidstrup, of El Dorado, owner.

*Big Cañon* (*Oro Fino*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 174 and 103–479. It is 5 miles S. from Shingle Springs, at 500′ elevation. Since our last Report a station has been made on the 400′ level of the main shaft, a drift run therefrom, and an incline sunk 200′ on an angle of 26°, with the aid of compressed air; drifts have been run both N. and S. from the winze. The present supply of milling ore is procured from between the 200′ and 300′ levels. The mill capacity has been increased by the addition of 10 stamps, while the individual weight of the stamps has been reduced from 1,400 lbs. by the removal of the iron bosses on the upper ends of the stems, it having been found that the jar of the heavy stamps caused a frequent breaking of the cam-shafts. The chlorination works are enabled, through the increase of the crushing capacity, to run continuously on a daily output of 5 tons. The power for the entire plant is derived from the 340 miner's inches of water furnished by the Diamond Ridge Ditch Co. The water is dropped into French Creek and taken through a leased ditch, 2 miles long, having a capacity of 400 miner's inches, and delivered at the works under 360′ head, using 1,200′ of 16″ and 11″ pipe. Five separate water-wheels, mostly Pelton, run the machinery. Forty-five men are employed. An incorporated company of San Francisco, owner; L. R. Poundstone, of Shingle Springs, manager.

*Big Jim* (*Phillips*) *Mine* (Quartz).—It is 2½ miles S.W. from Latrobe, at 325′ elevation, and comprises a part of an 800-acre agricultural patent.

It carries a N. and S. vein, which dips 45° E., between slate and diabase; the definite thickness of the vein has not yet been established; the surface along the strike and below the visible outcrop of the vein yielding free gold. A shaft has been started on the outcrop, as well as a tunnel on the mill level to intersect the same, while farther north at a point 100 below, a cross-cut 240′ long has been driven through 30′ of a siliceous slate belt with intervening quartz seams, to a vein, cutting a 2′ gouge of black graphitic clay filled with iron sulphurets. A Tremaine 2-stamp steam-power mill, discharging on three sides and carrying 850-lb. stamps, is in course of erection. Nine men are at work. Chin Sing, of Latrobe, owner.

*Big Sandy Mine* (Quartz).—See our Xth Report, p. 173. It is ¼ mile S. from Kelsey, in T. 11 N., R. 11 E., at 1,900′ elevation, and comprises 1,500′ by 600′, and 100 acres. The vein strikes N. and S. and dips 50° E., between slate walls, 11′ apart. The quartz carries high-grade iron and lead sulphurets. The present workings are confined to the sinking of a 5′x 9′ double-compartment perpendicular shaft, which was 165′ deep in May; it will cut the vein at 240′ in depth. It is being sunk by contract to the 300′ level, with three shifts. The hoist and 6′ plunger pump are run by a 5′ Pelton wheel working under 124′ pressure with 20 miner's inches of water from the California Ditch Co. A 10-stamp water-power mill is driven by a 3½′ Pelton wheel. Twelve men are employed. An incorporated company of Toledo, Ohio, owner; J. Kelley, of Kelsey, superintendent.

*Bitters Mine* (Placer).—See Two Channel.

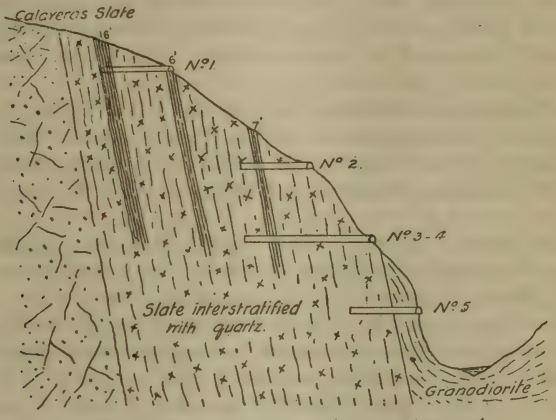
*Black Lead Mine* (Quartz).—See our XIIth Report, p. 104. It is 6 miles S. of Shingle Springs. Idle.

*Blacklock Mine* (Hydraulic).—It is 1½ miles N.E. from Placerville, at 2,100′ elevation, and comprises 60 acres of a lava-capped channel. The bank is from 50′ to 60′ deep, with alternating strata of pipe-clay, gravel, and sand, and 4′ of channel-wash gravel on the bedrock, carrying coarse gold. The large bowlders are removed by blasting. Water is obtained from the El Dorado Ditch Co., and costs 5 cents per inch per ten hours; 300 miner's inches are used under 180′ pressure, delivered through 1,200′ of 15″ and 11″ pipe to a giant with 11″ inlet and 4½″ nozzle. The tail flume is 150′ long, 2′ wide, rock paved, and set on a grade of 10″ per box; it dumps into Taylor Ravine behind four restraining brush dams, the longest being 75′ and 12′ high. Four men are employed. P. Watt and E. Piaggi, of Placerville, owners.

*Black Rock Mine* (Seam Diggings).—See our XIth Report, p. 203. It is at Georgia Slide, adjoining the Pacific Mine, at 2,275′ elevation, and comprises 26 acres. The company owns water-rights on Dark Cañon and Cañon Creek of 75 miner's inches, which are conveyed through 6 miles of ditch. Four men are at work. Flyn Bros. et al., of Georgetown, owners.

*Blue Bank Mine* (Quartz).—It is 9 miles N.W. from Shingle Springs, on the bank of Weber Creek, at 625′ elevation. The 18″ vein strikes N. and S., and dips 74° W., between slate walls. This is an old mine being reopened. The developments are a tunnel on the vein 120′ long, and a 100′ incline below the tunnel level; also, extensive surface washings and cuts. A small 2-stamp mill, with 250-lb. stamps, driven by an overshot wheel, has been placed near the tunnel's mouth for prospecting. Temporarily idle. Murphy Bros., of Lotus, owners.

*Blue Gouge Mine* (Quartz).—It is on Camp Creek, 9 miles E. from Pleasant Valley, at an elevation of 4,000′ on highest point and 3,200′ at creek level, comprising thirteen mining claims, giving 6,000′ along the ore-body, besides half a section of timber land contiguous. The veins strike N.W. and S.E., and dip 75° E. About 400′ of mineralized zone, between Calaveras slates on the east and grano-diorite on the west, is occupied by several parallel quartz veins, 7′, 6′, and 16′ wide, separated from the main walls and each other by intervening slates and schists of partly chloritic and talcose character, interlaminated with small sheets and kidneys of quartz. The entire body is stated by the owners to be auriferous to the extent of a general average of $2 50 per ton. They also state that the main quartz veins average $7 per ton, and the gold value decreases as the distance from the veins increases, and that none of the rock fails to give some "color." The sulphurets in this "formation" amount to 3½%, and are said to be of a good grade. The ground




PROFILE OF THE BLUE GORGE MINE.

has been exploited through five tunnels crossing the formation. No. 1, below the outcrop, is 150′ long; No. 2, 200′ lower, 180′ long; Nos. 3 and 4 are 150′ still lower and are on the same level, though 500′, apart; they are 125′ and 225′ long; No. 5 is 150′ below the preceding, and has penetrated 180′ across the formation, and is being continued. A No. 6 tunnel has been started on the same level as No. 5, but 800′ farther south. The largest of the three veins shows a bluish-black clay seam or gouge, 1′ wide, in the center of the quartz. The mine discharges a continuous stream (about 3 miner's inches) of water from the lowest tunnel. Water-power, lumber, and timber are convenient to the mine. Seven men are employed. Being developed under bond by Mackey, Flood, et al., of San Francisco.

*Board Mine* (Quartz).—See our XIIth Report, p. 104. It is ½ mile E. of Greenwood, and consists of two parallel claims. W. Board, of Greenwood, owner.

*Boneset Mine* (Quartz).—See our XIIth Report, p. 104. It is 6 miles N. of Shingle Springs. M. E. Gates, of Sacramento, owner.

*Boulder Mine* (Quartz).—It is 8 miles N.W. from Shingle Springs, at 1,150′ elevation, and comprises 1,500′ by 600′ on a vein, 7′ to 8′ wide, which strikes N. of E. and dips 35° N.W., in grano-diorite. Four tunnels

have been driven, and a fifth and lower one started; of these, only th two lower ones, 80′ apart, are in use; the upper portion of the mine bein practically stoped out. No. 4 is 400′ long, with a 100′ drift on the vein An upraise of 112′ on the slope of the vein is being driven to connec with an intermediate drift between No. 3 and No. 4, which was drive from the bottom of a winze in No. 3. The lowest tunnel, No. 5, start 200′ perpendicularly below No. 4. A 10-stamp water-power mill is bein erected. Ten men are employed. Rose Creek Mining Co., No. 163 Crocker Building, San Francisco, owner; F. W. Wilmans, president O. S. Buckbee, of Shingle Springs, superintendent.

*Bower Mine* (Seam Diggings).—See our XIth Report, p. 204. It is a Greenwood, and said to have yielded two million dollars. Idle. Cali fornia Water Co., owner.

*Bright Hope Mine* (Quartz).—It is in Sec. 2, T. 12 N., R. 10 E., mile N.E. from Georgetown, at 2,700′ elevation. During the past yea a 5′x 8′ shaft has been sunk 80′ and drifted from in the bottom, provin three parallel veins between slate and serpentine, varying from 7′ to 12 in width, and dipping S.W. in the shaft. Mrs. Gibbs and H. W. Hurl bert, of Georgetown, owners.

*Buckeye Hill Mine* (Drift).—See our XIIth Report, p. 105. It is miles N.E. from Georgetown, 2 miles W. of Volcanoville, at 2,730′ ele vation. Since our last Report the drifts have been extended, and por tions of the tailings reworked by Chinese. J. J. Flora, of Georgetown owner.

*Burt Alley Mine* (Placer).—See our XIIth Report, p. 105. It is miles below the crossing of Otter Creek by the Georgetown and Volcano ville trail. Forni & Smeder, of Georgetown, owners.

*Calaveras Mine* (Quartz).—It is 4 miles E. of Latrobe, at 525′ eleva tion, and comprises two claims under agricultural patent, designate the *Calaveras* and *Humiston*, one half mile apart. The vein trend slightly to E. of N., dips vertically on the contact of slate and green stone, and carries a heavy clay gouge. The quartz carries 5% of sul phurets, and shows some free gold in the horn-spoon along the outcrop On the Humiston claim the surface only has been worked by ground sluicing, while on the Calaveras the developments consist of two 5′x 7 shafts, 300′ apart, 53′ and 32′ deep. In the former is a 22′ cross-cut a 36′, which does not reach the wall. Several open cuts have been mad across the strike of the vein. Three men are employed. Dan Klos, o Latrobe, owner.

*California Jack Mine* (Quartz).—It is 3 miles W. from Georgetown at 2,315′ elevation. The vein strikes N. and S., dips 60° E., and shows a 12′ vein in the tunnel, between slate walls. The vein lies on the eas side of the Mother Lode belt, and carries 2% of sulphurets. It is being developed through a tunnel, 350′ to the vein, on which 100′ of a drif has been turned north. There is a 10-stamp mill on the property, wit 1,000-lb. stamps, driven by a 4′ Pelton wheel, with 30 miner's inches o water from the California Ditch Co., delivered through 1,100′ of 13″ pip under 223′ pressure. Usually, 20 men are employed. The mine is tem porarily idle. L. L. Beguette, W. McCewan, and N. D. Burlingame, o Garden Valley, owners.

*Cañon Creek Fluming Co.* (Placer).—See Gold Bug Mining Co.

*Carrie Hale Mine* (Drift).—See our XIIth Report, p. 105. It is 3 miles S. of Grizzly Flat. Idle. J. H. Bradley, of Placerville, owner.

*Cedarberg Mine* (Quartz).—It is 2½ miles N.W. from Greenwood, at ,300′ elevation. The vein strikes N. and S., and dips 57° E., between lack slate walls, 15′ apart; the pay-streak in the vein averaging 1′ in idth. This is an old mine on which work is being resumed. The ′x 12′ double-compartment shaft is 318′ deep on a 57° pitch, and is upplied with a steam hoist capable of sinking 1,000′. Two men are mployed. J. T. Smith, of Greenwood, owner.

*Cement Hill Mine* (Drift).—It is 4 miles N. of Georgetown, at 2,700′ levation. The claim contains a lava-capped ancient channel, partially eveloped. Since our last Report a second tunnel, now 600′ in, has been tarted to strike the channel 50′ deeper than the upper 750′ tunnel, vhich was too high. Two men are employed. Abraham Dow, of Georgetown, owner.

*Central Mine* (Quartz).—It is 5 miles S. of El Dorado. One of the ldest locations on the Mother Lode. Partly developed by tunnels and hafts. — Rix, of San Francisco, owner.

*Channel Bend* (*Gray Eagle Bar*) *Mine* (Drift).—It is 10 miles N.E. rom Georgetown, at 1,175′ elevation on the banks of the American River, 3 miles E. of Volcanoville, and consists of two claims known as he *Barnes* and the *McCall*. These two claims follow along the two arms f a bend in the former channel of the river, and the present company re exploiting the ground in the bend of the curve, behind the previ- usly worked ground, having the appearance of a back channel. The round is worked through a shaft 136′ deep, all in gravel, and which is onnected through an intermediate drift and an upraise with an adit. The width of the gravel has not been determined; drifts from 200′ to 300′ ave been run from the shaft, about 8′ or 10′ above the bedrock. Along his level the percentage of large bowlders is very great. The hoist is un by 10 inches of water from the Daggett ditch through 1,500′ of flume nd 1,000′ of 6″ pipe under 800′ pressure, on a 3′ Pelton wheel; the same water is used for washing the gravel for prospecting purposes. The luices are 300′ long. The mine makes from 8 to 10 miner's inches of water, which is also used for washing, Twelve men are employed. An ncorporated company, of No. 39 Sutter Street, San Francisco, owner; G. W. Miller, of Georgetown, superintendent.

*China Hill Mines* (Quartz).—See our XIIth Report, p. 106. They re 3 miles S.W. from El Dorado. — Johnston, owner.

*Church* (*El Dorado*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 191, 171, and 106. It is 2 miles S.E. of El Dorado, at 1,180′ elevation, and comprises three claims, two of which are 1,650′x 600′, and parallel, and the third, 1,500′x 600′. The vein strikes N. and S., dips 80° E., but changes the angle of the dip with depth. The three-compartment working shaft is 1,200′ deep, passing through the vein near the 400′ level, and requiring 300′ cross-cut in the bottom to the vein. The quartz makes in kidneys; sometimes these are 250′ in length; they carry 1½% of sulphurets of good grade, while the vein matter outside of the kidneys carries a larger percentage of sulphurets of lower grade; a black gouge, from 3″ to 12″ thick, accompanies the vein. Forty feet to the west of this vein is a parallel vein, 8′ wide, to which, on several of the levels, cross-cuts have been extended, but the quartz is of too low grade to permit of its being worked to a profit with the present milling capacity. The plant comprises a hoist, a 35 H.P. compressor running four Ingersoll drills, two jackhead and two plunger pumps above and three pumps

below, a 10-stamp mill, with stamps of 950 lbs. each, and four Fru vanners; all driven by 100 miner's inches of water from the Diamon Ridge Ditch Co., and applied under 465′ pressure through 3,250′ of 15 and 11″ pipe on a 6′ Dodds wheel for the compressor, two Peltons for hois and pumps, and a 6′ Pelton for the mill. The present ore-supply i obtained from below the 1,000′ level. Thirty men are employed. Churc Gold Mining Co., of San Francisco, owner; James Richards, of El Do rado, superintendent.

*Cincinnati Mine* (Quartz).—It is 2½ miles S. of Placerville, at 1,750 elevation. Idle. M. Miller and D. J. Knighton, of Diamond Springs owners.

*Claghorn* (*Growers*) *Mine* (Drift).—It is on Cedar Creek, 2 miles S of Fairplay, at 2,910′ elevation, and is an ancient channel running N.E and S.W., over a granite bedrock. There is a tunnel running on th rim 200′, where the pay-gravel is only 18″ deep, covered by a layer o cemented sand, which furnishes a good roof; there are no large bowlders The gold is both coarse and fine. The main channel has not yet beer reached. The washing of the gravel is done in a bedrock cut with th help of one box, with water from the Empire (Plymouth) ditch. Tw men are at work. Capt. G. S. Claghorn, of Fairplay, owner.

*Confederate Mine* (Drift).—It is 2½ miles S.W. from Fairplay, a 2,725′ elevation, and comprises 40 acres. A tunnel has been driver 250′ through granite bedrock and cemented sand, and the bedrock stil pitches away. A second tunnel, run 200′ on the course of the channe and partly in the bedrock, shows some cemented gravel and granitic sand, but gives no definite results as to the course or width of the chan nel. Two men are at work. D. M. Dunn and A. F. Gillespie, of Fair play, owners.

*Cousin Jack Mine* (Quartz).—See our XIIth Report, p. 107. It is miles S.W. of Grizzly Flat, at 2,800′ elevation. The vein courses N and S. Idle. Mrs. M. Jeffrey, of Grizzly Flat, owner.

*Crown Point* (*Bald Eagle*) *Mine* (Quartz).—See our XIIth Report, p 107. It is 1½ miles S.E. of Diamond Springs. James Richards et al. of Diamond Springs, owners.

*Crystal Mine* (Quartz).—See our XIIth Report, p. 107. It is on th Middle Fork of the Cosumnes River, 5 miles S. of Grizzly Flat. Idle. L. L. Alexander, of Omo Ranch, owner.

*Crystal Mine* (Quartz).—See our XIIth Report, p. 107. It is 3½ miles S. of Shingle Springs, at about 1,800′ elevation. Idle. G. Phelps et al., of Shingle Springs, owner.

*Crystal Mine* (Quartz).—It is ½ mile N. of Cool, at 1,900′ elevation. The vein courses N. and S. and dips 15° W. It shows stringers of quartz in quartz-porphyry, with limestone belt on the east. The quartz is milk white, with groups of crystals, and carries some copper sulphurets. The developments consist of a 25′ perpendicular shaft, from which an incline, 60′ in length, is sunk on the pitch of the vein, showing three stringers of quartz. There is another incline, 60′ long, from the surface; none of the works penetrate more than 70′, perpendicular depth. Two men are usually employed. E. Terry, C. Ashley, and C. Schulz, of Cool, owners.

*Dailey & Bishop Mine* (Quartz).—It is on Clear Creek, 2½ miles S. of Grizzly Flat, at 3,475′ elevation, and comprises two full claims on a vein striking E. of N., dipping 75° E., in a slate formation, and varying

n thickness from a seam to 3′. The quartz is glassy, with few sulhurets. The main working-tunnel has been driven 800′ along the ein, with a short cross-cut to the east; some stoping has been done bove the tunnel. Three hundred feet from the tunnel a shaft is being unk. A 10-stamp mill is in course of completion, with 750-lb. stamps, o be driven by a 4′ Knight wheel, with water from Clear Creek through . 2-mile ditch, giving 200′ pressure. A new style of concentrator, alled the Goldbug Chief, is being used in this mill; in its essential eatures it is an over-grown "rocker." Eight men are employed. — Bishop et al., of Grizzly Flat, owners.

*Dalmatia Mine* (Quartz).—See our VIIIth, Xth, and XIth Reports, pp. 177, 174, and 201. It is 6 miles N. of Placerville, and ½ mile E. of Kelsey, at about 2,600′ elevation. Idle. American River Syndicate Ltd.), of London, owner; William Husband, of Kelsey, superintendent.

*Darling Mine* (Quartz).—See our XIth Report, p. 202. Idle.

*Davidson Mine* (Quartz).—See our XIIth Report, p. 108. It is 3 miles N.W. of El Dorado, at about 1,700′ elevation. Idle. Thos. Davidson, of El Dorado, owner.

*Defiance Mine* (Quartz).—See our XIIth Report, p. 108.

*Dividend Mine* (Placer).—See our XIIth Report, p. 108. It is 3 miles W. of Shingle Springs, in T. 10 N., R. 9 E., at 1,280′ elevation, and comprises 3,136 acres on Kelly Creek. Since our last Report the property has changed owners, and about one half acre of ground has been worked with four men. D. C. Hodgkins, of Shingle Springs, owner.

*Donozo Gold Mine* (Quartz).—See our XIIth Report, p. 108. It is ½ mile E. of Greenwood. Idle. J. Donozo, of Greenwood, owner.

*Eagle Mine* (Quartz).—It is 1½ miles N.W. from Grizzly Flat, at 3,525′ elevation, and comprises three claims. The 3′ vein strikes E. of N., and dips 75° W., in grano-diorite. The quartz carries a good percentage of iron, zinc, and lead sulphurets in the pay-shoot, mostly next to the foot-wall. The pay-shoot has been followed 150′ in the tunnel, showing in the breast a vein 6′ wide between walls. The tunnel is 780′ long, and will be extended to tap a 200′ shaft. Two upraises connect this tunnel with the surface. Two men are employed. Mrs. Kate Smith, of Grizzly Flat, owner; S. Kendrick, of Grizzly Flat, superintendent.

*Eagle King Mine* (Quartz).—See our XIIth Report, p. 108. It is 2½ miles N. of Grizzly Flat, at 3,600′ elevation. An adjoining claim, known as the *Sunday*, has been added to it. The vein, 3′ to 4′ wide, strikes E. of N., and dips 75° W., in grano-diorite. The main working-tunnel has reached a length of 1,450′, and is still being driven ahead; a cross-cut from this level is being made to the Sunday vein, which will soon be cut. There is a 30′ winze below the main level, as well as a 150′ upraise connecting it with the surface. Some stoping has been done above the level. There is a 10-stamp water-power mill on the property, with 650-lb. stamps, of a crushing capacity of 16 tons per day; at present idle. Water is obtained from Tingley's ditch out of Big Cañon Creek, which is 5 miles long, and has a capacity of 50 miner's inches delivered under 130′ head to a 4′ Pelton wheel. When mill is running, 12 men are employed. John Melton and E. W. Witmer, of Placerville, owners.

*Edner Mine* (Quartz).—See our XIIth Report, p. 109. It is 7 miles E. of Fairplay, at 3,275′ elevation, and comprises 160 acres, held under an agricultural patent. The vein strikes N. and S., and dips 65° W.,

between granite and slate walls, widening as it goes down. The fissure is only partially filled with quartz; the latter is about 1½′ wide. A shaft has been started which is now 28′ deep, and a tunnel, now 50′ long, started to tap the shaft at about 170′ depth. A siphon takes the water from the shaft. Two men are at work. Charles Edner, of Omo Ranch, owner.

*El Dorado Big Tunnel Co.* (Quartz).—See our XIIth Report, p. 109. Since our last Report it has been acquired by the owners of the Gentle Annie Mine, who are driving the tunnel ahead. Gentle Annie Mining Co., of Placerville, owner.

*Elliot Mine* (Quartz).—See our XIIth Report, p. 109. It is on the south bank of Weber Creek, 2½ miles S. of Placerville. Idle. J. J. Elliot, of Placerville, owner.

*Emma Mine* (Quartz).—See our Xth Report, p. 176. It is a location adjoining and belonging to the Idlewild.

*Epley Mine* (Quartz).—It is on the Mother Lode belt, 2 miles S. of Placerville. Idle. See Placerville Gold Quartz Mining Co.

*Esperanza Mine* (Seam Diggings).—It is ¾ mile E. of Greenwood, at 1,950′ elevation, and comprises 1,500′ by 600′; the ground was formerly hydraulicked, but is now ground-sluiced by one man. P. Ritchie et al., of Greenwood, owners.

*Esperanza Mine* (Quartz).—See our Xth and XIIth Reports, pp. 175 and 109. It is 1 mile N.W. of Garden Valley. Provided with a steam hoist and a 20-stamp water-power mill. Idle. N. D. Burlingame, of Garden Valley, owner.

*Eureka Mine* (Quartz).—See our XIth and XIIth Reports, pp. 203 and 109. It is in Georgetown. Was equipped with hoisting works and a 10-stamp mill, which have been partially removed. Idle for years. E. B. Lee, of New York, owner; C. M. Fitzgerald, agent.

*Fisk Mine* (Quartz).—It is 1½ miles N. of Placerville, on Quartz Hill, at 1,900′ elevation, and comprises two claims of 600′ by 600′ each. The vein strikes N. and S., dips W., turning over later to the E., between serpentine on the west and black graphitic slate on the east. About 70′ E. of the vein is a belt, 100′ wide, of silicious slate and porphyry, carrying two seams of quartz, on one of which pockets of gold are not infrequent. The developments consist of two tunnels, one 50′ above the other on the one claim: No. 1, cross-cutting to the vein 75′ and turned 100′ on the vein; No. 2, though 160′ in length, lacks 40′ to reach the vein. On the second claim are three cross-cutting tunnels 75′ long, all about on a level and connected along the strike. The No. 2 tunnel on the first claim is intended for the main working-tunnel for both claims; it is connected by an upraise with the surface, 130′ from the mouth of the tunnel. The croppings extend from 25′ to 100′ in width, the quartz carrying some sulphurets and developing occasional pockets. Three men are at work. J. H. Skinner, of Placerville, owner.

*Fort Yuma Mine* (Quartz).—See our XIIth Report, p. 110. It is 6 miles S. of Shingle Springs. Idle. Hale & Baughman, of Omo Ranch, owners.

*Franklin* (*Tockey*) *Mine* (Drift).—It is 2½ miles E. of Placerville, at 2,075′ elevation, and comprises 50 acres on an ancient channel. A 1,400′ tunnel has been driven through the bedrock, and a 75′ upraise made to a high gravel bench, upon which a 600′ drift has been run. The breasts are carried 4½′ high, 30′ wide, and are timbered with post

nd cap. The channel carries white quartz gravel, somewhat cemented; breaster removing 3 tons per shift. The gravel is worked in a 10-stamp ill, crushing 6 tons per stamp per day, through a No. 10 wire screen riven by a 4′ Knight wheel under 185′ head, with water received from he El Dorado Water Co.'s ditch through 675′ of 7″ pipe. Below the ill is 100′ of sluices. During the past year about an acre of ground as been worked. Twenty-six men are employed. Messrs. Wright, of ndianapolis, and Picket & Clarke, of Placerville, owners; Thomas larke, of Placerville, superintendent.

*French Mine* (Seam Diggings).—See our XIIth Report, p. 110. It is mile W. of Greenwood, at 1,700′ elevation. Idle. L. Lechance, of reenwood, owner.

*French Hill Mining Co.'s Mine* (Quartz).—See our XIIth Report, p. 110. t is 6 miles N. from Greenwood, near Spanish Dry Diggings, at 1,900′ levation. Idle. A. J. Johnston et al., of Sacramento, owners.

*Garfield Mining Co.'s Mine* (Quartz).—See our XIIth Report, p. 110. t is ¼ mile from Volcanoville. Idle. E. W. Chapman, of Greenwood, wner.

*Garfield and Excelsior Consolidated Gold Mine* (Quartz).—See our XIIth Report, p. 111. It is 1 mile N.E. of Greenwood. Idle. F. G. Bilty et al., of Greenwood, owners.

*Garibaldi Consolidated Gold Mine* (Quartz).—See our XIIth Report, p. 111. It is ¾ mile from Greenwood. Idle. Mrs. Lee and J. Wolf, of Greenwood, owners.

*Gentle Annie Mine* (Quartz).—See our Xth and XIIth Reports, pp. 177 and 111. It is 1½ miles N. of Placerville, in Sec. 6, T. 10 N., R. 11 E., at 2,000′ elevation, and comprises a number of claims. The principal ones are: the *Accidental*, *Belle*, *Big Tunnel*, *Bona Sorta*, *Fortuna*, *Gentle Annie*, *Humming-Bird*, *Independence*, *Jackson*, *Lion*, *Logan*, *McNeill*, *Napier*, *Poverty Point*, *Sobrante*, *South Extension of Napier*, and *Surplus*. Since our last Report the main shaft on the Gentle Annie has been continued to the 300′ level, with a 30′ sump, an increase of 100′, and a level driven north 260′ on the vein, which is 8′ wide and well mineralized. At 240′ from the shaft an upraise, at present 30′ high, is being made to connect with the works above. The 200′ level has been extended 400′ north, showing an 8′ vein, and 200′ south, showing 15′ of quartz. The company, in getting possession of the Big Tunnel claim, have utilized its compressor for hoisting and pumping at the Gentle Annie shaft, as well as for running the machine drills. The compressed air is conveyed through 3,000′ of 5¼″ pipe, reducing to 1,500′ of 3″ and 2″ branch pipes.

In the *Big Tunnel Claim* the main tunnel has been extended 150′, passing through an 8′ quartz vein and 125′ of an excellent quality of roofing slate. In the mill 64 sq. ft. of plating has been replaced by 32 yds. of Brussels carpet; a 2′x 4′ amalgamating barrel put in for working the richer grades of slimes. The carpets are washed twice every shift into a separate tank; after settling, the slimes are placed with water in the amalgamating barrel, 500 lbs. to a charge, and ground with the aid of iron balls. Later, from ½ to ¾ of a pint of commercial sulphuric acid is introduced, and the grinding continued. Two hours prior to discharging, quicksilver is introduced. When ready to discharge, a catch-all box, with a partition in the center, is placed on the apron-plate beneath the barrel, which is turned, with the plug for dis-

charging the quicksilver on the upper side, slightly to the front, and a iron pipe, from 2′ to 3′ long, tightly inserted in the plughole, through which water from the hose is introduced to boil out the finest slimes which are caught in the catch-all box below, and float out over the apron-plate. The pipe is then removed, and the hose plays directly through the plughole for a short period. The plughole is then closed and the manhole is turned on top, and the coarser material gradually hosed out; while, at the same time, the quicksilver is forced by the water to the ends of the barrels. The bulk of the material having been washed out, the residue, with the quicksilver, is removed, and the latter freed from any iron, and squeezed through the straining cloth. Fifteen men are employed. John Melton and Benjamin Parlow, of Placerville, owners.

*German* (*Haeger*) *Mine* (Quartz).—It is 5 miles S. from El Dorado, at 1,150′ elevation, and comprises 1,500′ by 600′, and an 80-acre lot. The vein strikes N. and S., and dips 60° E., between a slate hanging-wall and a porphyry foot-wall, with 8′ of quartz with high-grade sulphurets. A 5′x 8′ double-compartment shaft is 130′ deep on the slope, with a 50′ drift. At present a cross-cut, to date 80′ long, back of the shaft is being driven to a parallel vein. The hoist and Cornish pump are driven by a 3′ Pelton wheel under 300′ pressure with 7 miner's inches of water from the Diamond Ridge Ditch Co. Twelve men are employed. H. Haeger and J. H. Stratten, of El Dorado, owners.

*Giltedge Mine* (Drift).—It is 3 miles S. of Fairplay, at 2,800′ elevation, and comprises 160 acres on an ancient channel. The gravel is capped with a layer of cemented sand and pipe-clay, and carries, besides quartz, slate bowlders and considerable clay. The gold is mostly on the bedrock, and coarse. The main gangway, 300′ long, is timbered with 6½′ posts and 3′ 6″ caps, and is driven partly in the bedrock the entire distance; the breasts are carried 4′ high and 20′ wide. The gravel is washed twice; first through 400′ of a bedrock cut, after which it is left to slack; only half the gold being obtained from the first washing. The mine water is used for washing purposes. Two men are at work. Norton & Amsden, of Uno, owners.

*Gold Bug Mining* (*Cañon Creek Fluming*) *Company* (Placer).—See our XIIth Report, p. 105. It is 3 miles N.W. from Georgetown, at 2,150′ elevation, and comprises 4 miles of the bed of Cañon Creek immediately below Georgia Slide, and 300 acres of adjacent ground. The tailings from the Georgia Slide seam diggings and adjacent mines emptying into this portion of Cañon Creek have been restrained by a natural rock-dam, which the present company purpose cutting through with a sluiceway deep enough to permit the rewashing of these tailings, as well as any virgin gravel that remains on the original creek-bed. On the upper stretch of 1½ miles a grade of 83′ can be had by cutting down the rock barrier 20′ and giving the sluiceway a width of 12′ to 14′. At present the ledge has been cut down for a length of 120′ to a depth of 20′, and for 400′ to a depth of 12′. Two flumes have been built, one 100′ long and 12′ wide, on a grade of 13″ to 12′, together with a 12′x 54′ undercurrent; the other is 50′ long, 12′ wide, with an undercurrent 36′ long and 22′ wide. The paving is made of alder blocks, 6″ and 12″ deep. Up to date, 1,000′ of the channel has been partially cleared. Four thousand miner's inches of water is available. Thirty-five men will be employed. An incorpo-

ated company of Cleveland, Ohio, owners; H. Tenbrock, of Georgetown, uperintendent.

*Golden State Mine* (Quartz).—See our XIth and XIIth Reports, pp. 04 and 111. It is 4 miles N.E. from Georgetown, at 2,700′ elevation. Three men are employed. W. Barklage et al., of Georgetown, owners.

*Golden Trace* (*Bullard*) *Mine* (Quartz).—It is 2½ miles N. of Grizzly Flat, between the Treat and Melton mines, at 3,400′ elevation. The vein strikes N. and S., and dips 70° W., in a granite formation; it is 2½′ wide and carries iron, zinc, and lead sulphurets. There is a 250′ tunnel on the vein, with two upraises, 25′ and 35′ high. The North Fork of the Cosumnes River passes through the claim, which is also well supplied with timber. Only assessment work is done.

*Gopher and Boulder Mine* (Quartz).—See our VIIIth Report, p. 175. It is ½ mile W. of Kelsey, at 1,950′ elevation, and comprises 3,000′ by 300′. The vein strikes N. and S., and dips 60° E., between a slate foot-wall and greenstone hanging-wall, and is from 8′ to 9′ wide. The 200′ incline shaft is being kept pumped out, otherwise the property is idle. The hoist is run by water-power, while the 20 stamps and two 5′ Huntington mills are run by electricity generated on Rock Creek. Three men are employed. Gopher and Boulder Mining Co., of Kelsey, owner; W. Husband, of Kelsey, manager.

*Grand Victory Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 194, 178, and 112. It is on Squaw Creek, 7 miles S.E. from Placerville, at 2,100′ elevation, and comprises 160 acres of mineral land, on which are the quartz locations. The ore-body is in a black quartzite lying in slate of the Calaveras formation near the granite contact, striking N.W., with a nearly vertical dip. Since our last Report the tunnel on the mill-level has been extended to 500′, and two shafts, a vertical and an incline, 85′ and 100′ deep, have been sunk, and both connected by a drift at the bottom. Two separate ore-bodies have been cross-cut, showing a width of 64′ and 125′, with slate intervening. These ore-bodies are being chambered out and timbered with square sets. Connection has also been made with the large pits mentioned in previous reports, from which the ore was formerly quarried, furnishing a good natural ventilation. The ore carries 3% of low-grade sulphurets. The hoist on the incline shaft and the machine drills are run by compressed air. The main station and tunnels, as well as the mill and general plant, are all lighted by electricity from a 100-light Mather shunt-wound dynamo, with a capacity for 125 sixteen candle-power, 100-volt lamps. The dynamo is connected direct with the counter-shaft in the mill. Of the 50 stamps in the mill, 20 are in operation; they weigh 1,000 lbs. each, and are run at 95 drops of 6½″, giving a crushing capacity of 2 tons per stamp per day, There are nine Frue and five Triumph concentrators, and the entire outfit is run by an 8′ hurdy wheel with hemispherical buckets, under 107′ head, with water from the Diamond Ridge Ditch Co. The chlorination plant, consisting of a 5-ton furnace, vats, etc., will be started as soon as the entire 50 stamps are dropping. Thirty-three men are employed. J. C. Wright, of Indianapolis, Ind., and H. E. Pickett, of Placerville, owners; T. J. Houghton, of Placerville, superintendent.

*Gray Mine* (Quartz).—See our XIIth Report, p. 119. It is 3 miles N. of Shingle Springs. Idle. D. C. Hodgkins, of San Francisco, owner.

*Gray Eagle Cliff Mine* (Drift).—See our XIIth Report, p. 112. It is in Volcanoville, at 2,900′ elevation, and contains 100 acres. D. C. Webster, of Georgetown, owner.

*Greenstone* (*Barnes*) *Mine* (Quartz).—See our XIIth Report, pp. 10[illegible] and 112. It is 3 miles N.E. of Shingle Springs, at 1,500′ elevation. Idle. H. Barnes, of Shingle Springs, owner.

*Griffith & Bryant Consolidated Mine* (Quartz).—See our XIIth Report, p. 112. It is in Sec. 30, T. 10 N., R. 11 E., 1 mile E. of Diamond Springs, at 1,700′ elevation, and comprises 3,000′ by 600′. Three men are at work. C. F. Bryant, of Diamond Springs, owner.

*Grizzly Flat Gold Mining Co.'s Mine* (Drift).—It is in Grizzly Flat, at 3,725′ elevation, and comprises 320 acres. The channel runs N. and S. and was formerly worked by the hydraulic method. Latterly a main drift has been driven 150′ to the center of channel, partly in bed-rock, and a gangway started, now 150′ long, up the channel. The main tunnel was continued across to the opposite rim, 550′ distant, showing either an island 18′ across in the center of the channel or a back channel. The main drift has steel T rails, 4 lbs. to the foot. The mine does not make any waste, and has good natural ventilation. No breasting has been done to date. The granite bedrock requires no timbering. The gravel is 4′ thick on the bedrock cemented, capped with 2′ of cemented sand, followed by 3′ more of gravel overlaid with 40′ of lava; it will have to be milled to free the gold, which is scaly and partly black. Water is diverted from Steely Fork of the Cosumnes River through 7 miles of ditch, of 800 miner's inches capacity, and delivered in the old hydraulic pit under 180′ pressure, where the mill is to be erected. Four men are employed. An incorporated company, owner; G. E. Mainhart, No. 211 Sansome Street, San Francisco, secretary; A. A. McDonald, of Grizzly Flat, superintendent.

*Grouse Gulch Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 178 and 113. It is 1½ miles W. of Grizzly Flat, at 3,700′ elevation, and contains 1,500′ by 600′. Idle. Mrs. K. Smith, of Grizzly Flat, owner.

*Hardscratch Mine* (Quartz).—It is 2 miles W. of Grizzly Flat, at 3,500′ elevation. The vein strikes N.E. and S.W., and dips W. The vein is from 2″ to 18″ wide, between granite walls, greatly decomposed, furnishing running ground when saturated with moisture. A 120′ cross-cut reaches the vein, upon which is a 100′ drift; there is also a 26′ shaft. The entire workings were closed at date, on account of a run or slide on the surface. There is a small water-power mill of the Dyer cannonball pattern, with a capacity up to 4 tons per day. The power is brought from String Cañon through 1 mile of ditch and 12″x 12″ flume, of 80 miner's inches capacity, to a 3′ Dyer wheel with cast-iron buckets, under 65′ head, giving the mill 90 revolutions per minute. Two men are at work. Alderson & De Launy, of Grizzly Flat, owners.

*Harmon, Old and Young, Mines* (Quartz).—They are 1 mile N. of Placerville, and are included in the group of mines from the American River to Weber Creek. Idle. See Placerville Gold Quartz Mining Co.

*Harnish Mine* (Drift).—It is 1½ miles S. of Fairplay, at 2,820′ elevation, and comprises 40 acres. It is on the old Fairplay channel, and has a tunnel started on the bedrock; 50′ in the bedrock pitched, and the tunnel was turned along the rim. The claim, which has only recently been opened, shows 4′ to 5′ of gravel next the bedrock, carrying considerable mica, with very few bowlders. One man extracts 3 tons of gravel per day. Two men are at work. S. A. D. White and J. H. Harnish, of Fairplay, owners.

*Havilah* (*Hendy or Nashville*) *Mine*.—See Nashville.

*Hayward Gravel Mine* (Hydraulic).—It is in Indian Diggings, at 3,150′ elevation, and comprises 358 acres on an ancient channel. The bank is 175′ high, of which 159′ is gravel, with cement capping. Water is taken from the Middle Fork of Cosumnes River through the Empire (Douglas) ditch, 28 miles long, 5′ wide on top, 2½′ on bottom, 2½′ deep, with 16′ grade per mile, carrying 900 miner's inches of water, delivered at the mine under 260′ pressure. The dump is into Indian Creek. A sawmill is under construction. Seven men are employed. Plymouth Consolidated Gold Mining Co., of Oakland, owner; J. Crane, of Plymouth, Amador County, superintendent.

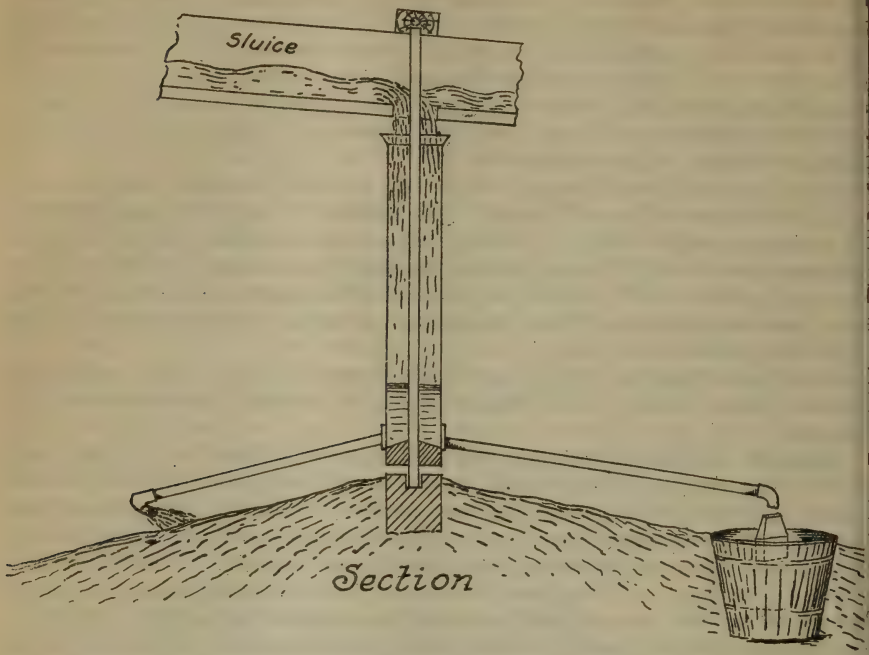
*Humphrey's Mine* (Quartz).—It is 2½ miles S.W. from Fairplay, at 2,475′ elevation. The 16″ to 24″ vein strikes E. and W., and dips 80° S., between granite walls. The developments comprise a 4′x 6½′ double-compartment shaft, 15′ deep; at the shaft collar a tunnel, driven 70′ on the vein, shows a 20″ vein in the breast. The quartz carries 1½% of iron and lead sulphurets. Three men are at work. O. H. Elliott, of San Francisco, owner.

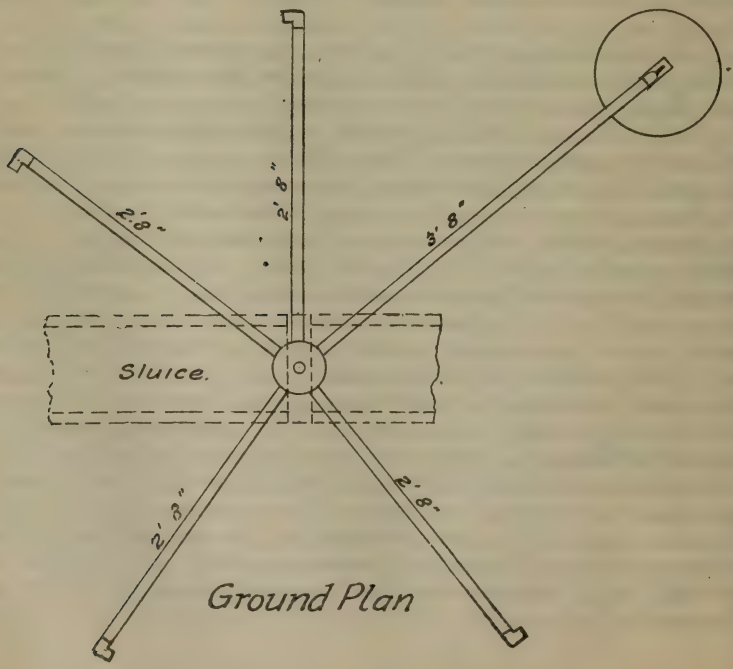
*Ibid Mine* (Quartz).—See our XIIth Report, p. 113. It is 1 mile S. of Grizzly Flat. Idle. C. W. Watts and T. D. Crocker, of San Francisco, owners.

*Idlewild* (*Taylor*) *Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 168, 176, 205, and 113. It is 3 miles E. from Greenwood, and 5 miles W. of Georgetown, at 2,125′ elevation. Since our last Report the main shaft has been carried down to a depth of 670′, and drifts have been opened along the vein for a distance of 500′ from the shaft. The plant on this mine is one of the most complete to be found for its size, and is admirably arranged, comprising, besides the hoist, pumps, compressor, machine-shop, mill, concentrating floors, two saws (one for lumber, with a capacity of 10,000′ per day, and the other for cutting wood), boarding-houses, offices, laundry, dwelling-houses for the men and officials, etc. The entire property is lighted by electricity, which is also applied in part as power. The compressor, 18″x 24″, runs three Ryan power drills. On the 500′ level is an electric pump, and a duplex Worthington on the surface, run by compressed air; also a Dow hydraulic plunger pump. The crushing capacity of the mill has been increased by the addition to the 40 stamps of a Dodge pulverizer of 25 tons capacity per twenty-four hours. There are 14 wheels to drive the machinery, taking water from the California Water Co. A new automatic sampler for mill tailings is used at these works, consisting, in general terms, of a Barker re-action water-wheel, driven by the tailings water, with one of the arms extended 1′ beyond the rest, and with the outlet turned downward, in which position it passed at each revolution over a covered bucket, with a raised slot, $\frac{1}{16}$″x 4″, in the center of the lid, which permits of a small amount passing into the bucket. (See illustration, p. 146.) Sixty-two men are employed at the works. Idlewild Gold Mining Co., owner; E. W. Chapman, of Greenwood, manager.

*Independence Mine* (Quartz).—It is 3 miles N.E. from Omo, at 3,000′ elevation, and comprises three claims, designated the *Independence*, *Louisiana*, and *Whim Lead*, situated on the same vein as the Stillwagon, striking N.E., and dipping S., between granite walls. There is an old 90′ shaft and three tunnels. Only assessment work. W. P. Stanley, of Placerville, manager.

# IDLEWILD Co's TAILING SAMPLER



*Indian Creek Land and Mining Co.'s (Shaw) Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 193, 181, and 114–481. It is situated 7 miles W. of Placerville and 3 miles N.W. from El Dorado. An incorporated company, owner; D. W. C. Morgan, of El Dorado, superintendent.

*Indian Diggings Creek Mine* (Placer).—It is at Indian Diggings, at 3,000′ elevation, and comprises 102 acres, extending 1 mile down the creek. The bedrock has not been reached yet. The gravel contains two grades of gold; that taken from the main channel sells for over $20 per oz., while the rim channel gold is worth only $17 50 per oz. The wash in the channel consists of quartz and slate underlaid with marble. Water for washing is taken from the Empire ditch with 300′ pressure, delivered to a small-sized giant with 2″ nozzle. The flume is 300 yds. long, 24″ wide, paved with rock, and set on a 5″ grade to the box, and dumps into Scott Creek. Water costs 5 cents per inch. Five men are at work. J. Kohlert, of Indian Diggings, owner.

*Inez Mine* (Quartz).—See our Xth and XIIth Reports, pp. 171 and 114. It is 8 miles S. of El Dorado and 1 mile N.E. of Nashville. Idle. J. C. Heald, of Nashville, superintendent.

*Jerusalem Mine* (Hydraulic).—See our XIIth Report, p. 114. It is 1¼ miles E. of Placerville. Idle. Thomas Alderson, owner.

*Josephine Mine* (Quartz).—See our VIIIth Report, p. 165. It is ½ mile E. of Volcanoville, at 2,900′ elevation. During the past season an old tunnel has been cleared out. Idle. J. W. McCall et al., of Nevada City, owners.

*Kates (Norris) Mine* (Drift).—See our XIIth Report, p. 114. It is 1¼ miles E. of Volcanoville. Idle. S. P. Kates et al., of Georgetown, owners.

*Kentucky Flat Gravel Mine* (Drift).—See our XIIth Report, p. 115; also, Two Channel Mine.

*Lady Blanche Mine* (Quartz).—It is 3½ miles E. of Fairplay, at 4,480′ elevation, and comprises three claims. The vein, 1′ to 4′ wide, strikes N. 20° W., and dips 50° E., between a slate foot-wall and a porphyry hanging-wall. The developments consist of an 180′ tunnel near the end line, and an 80′ cross-cut 225′ below, which will have to be extended 375′ to cut the vein. Three men are at work. J. E. Stratton, of San Francisco, owner.

*Lady Emma Mine* (Quartz).—It is 1 mile E. of Kelsey, at 2,000′ elevation. The 4′ vein strikes N. and S., and dips 60° E., between slate and porphyry walls. The vein is worked through a 5′x 6′ incline to a depth of 300′, with drifts on the vein of 150′ both ways at every 100′. The bottom drift was being run in May, 1896, showing that the vein increases with depth. A second and vertical shaft, 150′ W. of the main slope, has reached a depth of 50′, where a cross-cut is being driven to intercept a vein on the west, about 40′ distant, which shows 6′ wide on the surface. The east vein carries mariposite. The entire works are run by 18 miner's inches of water through 600′ of 11″ pipe, on an 8′ Morey wheel for the pumps and an 18″ Pelton wheel for the hoist, under 155′ pressure, and obtained from the California Water Co. The 4″ plunger pump raises 3 miner's inches of water. The recently erected mill has 10 stamps of 800 lbs. weight, with two concentrators and a Gold King amalgamator, all geared from a 5′ Pelton wheel. Twelve men are

employed. Worked under bond by an incorporated company of San Francisco. S. W. Beardslee, of Kelsey, superintendent.

*La Moille Mine* (Quartz).—See our XIIth Report, p. 115. It is 5 miles S. of El Dorado. Idle. H. Sutliffe, of San Francisco, owner.

*Larkin Mine* (Quartz).—It is 3½ miles S. of Placerville and 1 mile E. of Diamond Springs, at 1,800′ elevation, and comprises 2,200′ on the strike of the vein, with a width of 1,000′ at one end and running to a point at the other end. The 3′ ledge strikes E. of N., and dips 80° E. The quartz makes in kidneys between the slate and greenstone walls. The vein is worked through a single-compartment vertical shaft 250′ deep, with drifts both ways on the 100′, 200′, and 250′ levels. The light hoist and 4″ jackhead pump are run by steam. Seven men are employed. A 5-stamp steam-power mill, with frame for 10, is being built. Larkin Mining Co., of San Francisco, owner; Col. D. H. Jackson, of Placerville, superintendent.

*Last Chance Mine* (Quartz).—It is on Quartz Cañon, 1 mile S. from Volcanoville, at 2,900′ elevation. The vein, 5′ wide, strikes E. and W. and dips 55° S., between a porphyry hanging-wall and a slate foot-wall. A perpendicular shaft has been sunk 50′, and a short drift extended south 15′ from the bottom, exposing a 5′ vein of low-grade ore, which is cut at another point 100′ deep by a 400′ cross-cut. A 4-stamp mill, with 500-lb. stamps, situated on Otter Creek, 1 mile from the shaft, and driven by an 18′ overshot wheel, with a crushing capacity of 4 tons per day, belongs to the property. One man is at work. Wilson Cary, of Georgetown, owner.

*Levenson's Mine* (Hydraulic).—It is 1 mile S.E. from Fairplay, at 3,050′ elevation, and comprises 60 acres. The gravel bank is 50′ deep, with 6′ of soil capping. The cut is 250′ long and 60′ wide; half an acre of ground was removed the past season; several acres have been removed through another cut on the opposite side of the gravel ridge. The bowlders have to be removed by blasting. The gold is coarse. The water is obtained from the Empire Ditch Co., and 150 miner's inches are used for piping, etc., delivered through 600′ of 11″ and 7″ pipe, under 75′ pressure, to one giant with 3½″ nozzle. The sluices are 120′ long, set on an 8″ grade and furnished with pole riffles. The water season is continuous. On the south side of the ridge a tunnel, 150′ long, has been driven to the edge of the gravel, proving the channel to be the same width. Six men are employed. Levenson Bros., of Fairplay, owners.

*Linden Mine* (Drift).—See our VIIIth and XIIth Reports, pp. 196 and 115. It is 1 mile E. of Placerville, at 2,025′ elevation, and comprises three claims, designated *Cedar Springs*, *Globe*, and *Linden*. It employs 25 men when running the mill, 10 stamps of 450 lbs. each, which crushes from 60 to 80 tons of gravel daily through a No. 16 wire screen. An incorporated company of Boston, Mass., owner. In the hands of a receiver. John Rowland, of Placerville, foreman.

*Lincoln Mine* (Seam Diggings).—It is 1¼ miles N.W. from Georgetown, at 2,350′ elevation, and comprises 20 acres. This seam belt strikes N. and S., is 300′ wide, and is worked through a 100′ cut and three tunnels, 150′, 60′, and 110′ long. Water for washing is obtained from Oregon Cañon, through 600′ of 12″x 14″ flume, with 1″ grade per foot. One hundred miner's inches are delivered through 800′ of 15″ and 11″ pipe to a 2½″ nozzle; the water season lasting nine months. The dump

s into Oregon Cañon, through two strings of 20″ sluices, 900′ in total ength, on 12″ grade per box. Two men are employed. M. D. Haskins, f Georgetown, owner.

*Live Oak Mine* (Quartz).—It is 3 miles S. of Placerville, at 1,775′ levation. It adjoins the Larkin on the S. and the Griffith Consolidated n the N., and is on the same vein, which courses N. and S., and dips E. he outcrop is 30′ wide in places. There is a 30′ shaft on the claim. ot working at date. An incorporated company, owner; D. H. Jackson, f Placerville, manager.

*Log Cabin* (*Darrow*) *Mine* (Quartz).—See our XIIth Report, p. 116. t is in Sec. 30, T. 9 N., R. 10 E., about 5 miles S.E. of Shingle Springs, at 900′ elevation. The vein strikes N.W. and S.E., and dips 55° N., between serpentine and slate walls, and is from 2′ to 16′ wide; he quartz makes in bunches between the walls. The vein is worked hrough a 200′ tunnel and 350′ of drifts along the vein, giving 100′ of backs. Near the tunnel is a 30′ shaft. A length of about 80′ has been stoped bove the tunnel. About 1½ miner's inches of water issues from the unnel. The 5-stamp water-power mill, with 900-lb. stamps, is run at a speed of 100 drops per minute, dropping 5½″, giving a capacity of 15 ons per day. The Diamond Ridge Ditch Co. supplies 33 miner's nches of water, delivered, through 350′ of 11″ pipe, on a 4½′ Knight wheel. Six men are employed at the mine. A. Darrow, of Shingle Springs, owner.

*Lone Jack Mine* (Quartz).—See our Xth Report, p. 176. It is 1 mile N.W. of Garden Valley and 1 mile S. of the Idlewild Mine. After a season of rest, work has been resumed by a Los Angeles company. N. D. Burlingame, superintendent.

*Lone Star Mine* (Quartz).—See our XIIth Report, p. 116. It is on Mathenas Creek, 6 miles S. of Placerville, at 1,700′ elevation. The vein, with a width varying from 2′ to 5′, strikes slightly E. of N., and lies between slate and greenstone. A tunnel is being driven to tap an old shaft, and was 200′ long in June last. Two men are at work. Col. D. H. Jackson, of Placerville, superintendent.

*Lone Star Mine* (Quartz).—See our XIIth Report, p. 116. It is 1¼ miles S. of Nashville, at 900′ elevation. Idle. J. C. Heald, of Nashville, owner.

*Lookout and K.K. Mines* (Quartz).—They are in Quartz Cañon, 1 mile S. of Volcanoville, at 2,900′ elevation, and comprise two claims worked in conjunction. The Lookout vein strikes N. and S., and dips E; the K.K. strikes N.E., with heavy croppings, 20′ to 30′ wide, inclosed in slate; the vein of the Lookout varies from a seam to 12″ wide, between porphyry and slate walls, finally running into the slate entirely. The developments on the Lookout consist of a tunnel, 200′ long, cross-cutting the porphyry to the vein and turned both N. and S., some 40′ to 50′, showing the vein broken up. A 3′x 4′ incline on 55° slope has also been sunk 34′, and drifting commenced from the bottom. One man is at work. Wilson Cary, of Georgetown, owner.

*Lucinda Mine* (Quartz).—It is on Wisconsin Gulch, near the North Fork of the Cosumnes River, 3 miles W. from Grizzly Flat, at 2,875′ elevation. The 6″ to 3′ vein strikes E. and W., and dips 70° N., between granite and slate walls. The developments are carried on through a 50′ perpendicular shaft and a 150′ cross-cut to the vein. Idle. Mrs. Nail and D. Gallagher, of Grizzly Flat, owners.

*Lucky Marion* (*Shepherd*) *Mine* (Quartz).—It is ½ mile W. of Green wood, at 1,830′ elevation, and comprises 73 acres. The vein strikes N 30° W., and dips 56° N.E., between serpentine hanging-wall and slate foot wall, 31′ apart, and includes a talcose schist casing. The main 3½′x 5½ incline is 107′ deep, and is timbered with 6″x 8″ posts and 6″x 10″ caps and closely lagged with 3″ planking. At 85′ it cuts through a greenish quartz stringer, 18″ to 24″ wide, carrying coarse gold, resting along gray quartzitic rock, which carries 2% of gold-bearing pyrite of a high grade. The shaft has a steam hoist, capable of raising 1,000 lbs. and skip from a 500′ depth. A 60-gal. Hooker sinking and a 30-gal. Deal pump, with a 25 H.P. boiler, complete the outfit. Seven men are employed. An incorporated company, No. 619 St. Charles Street, St Louis, Mo., owner; J. W. Nier, of Greenwood, manager.

*Mammoth Mine* (Quartz).—It is 8 miles N.W. of Shingle Springs, at 1,100′ elevation, and comprises 22½ acres. The vein, from 3′ to 4′ wide strikes N.E. and S.W., and dips W., in grano-diorite. A pay-shoot has been traced along 200′ of the surface, carrying 1½% to 2% sulphurets but the general appearance of the vein is "hungry" looking. A 10 stamp mill placed near Weber Creek, run by water-power, belongs to the mine; it has free water from Weber Creek through ¾ mile of ditch using 200 miner's inches under 42′ head. Temporarily idle. Jaspar Jurgens, of Lotus, owner.

*Manzanita Queen* (Quartz).—See our VIIIth and Xth Reports, pp. 189 and 172. It is 1½ miles S.E. of Diamond Springs. A 2-stamp Briggs mill has been crushing, it is said, 8 tons of quartz per day. It is run by a 3′ Knight wheel under 280′ head, with 18 miner's inches of water from the Diamond Ridge Ditch Co. Below the mill is a Seymour's centrifugal concentrator. Since our last Report the tunnels and shafts have been extended. Eight men are employed. C. F. Bryant et al., of Diamond Springs, owners.

*Mathenas Creek* (*Schneider*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 190, 172, and 117. It is 2 miles S. of Diamond Springs. Idle. Sacramento Development Co., owner; R. T. Morrison of El Dorado, manager.

*McCall Gravel Mine* (Drift).—See our XIIth Report, p. 116, and also Channel Bend Mine.

*McNulty* (*Oakland*) *Mine* (Quartz).—See our XIIth Report, p. 117. Dismantled. J. B. Drury, of St. Louis, Mo., owner.

*Melton Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 177 and 117. It is 2½ miles N.E. of Grizzly Flat. Idle. A Cleveland Ohio, company, owner.

*Miller* (*Ribbon Rock*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 189, 177, and 117 and 122. It is 2½ miles S. of Placerville, and adjoins the Superior Mine. Idle. Moses Miller, of Placerville, owner.

*Mississippi Mine* (Drift).—See our XIIth Report, p. 117. It is 1½ miles E. of Volcanoville. Idle. C. F. Lloyd, of Georgetown, owner.

*Molkey Mine* (Hydraulic).—It is 1 mile S.E. from Fairplay, at 2,870 elevation, and comprises 160 acres. The course of the main channel is N.E., running apparently with the ridge and under it; the present bank in the cut is on an outbreak from the channel proper. The gravel lies both above and below a 10′ strata of pipe-clay, on granite bedrock, and is capped with 4′ of soil; it contains lava bowlders and considerable

lay, and carries coarse gold. Water is brought from Slug Gulch, in the Hale ditch, which has been leased; it is 16 miles long, and carries 400 miner's inches of water, which is delivered under 200′ pressure, through 1,200′ of 11″ and 7″ pipe, to one monitor, using 1½″ and 3″ nozzles. The water season lasts six months. The tail flume is 150′ long, 22″ wide, and supplied with pole riffles; it dumps into Stoner Creek, where there are two restraining dams, 12′ high, built of logs. Eight men are employed. J. D. Spreckels, of San Francisco, and S. Molkey, of Napa, owners; S. Loveless, of Fairplay, superintendent.

*Montana Mine* (Quartz).—It is in Quartz Cañon, 1 mile S. of Volcanoville, at 2,680′ elevation. The vein strikes N. and S., dips 50° E., and has a width of 14′ between porphyry and slate walls. It is being developed through an incline 45′ deep, as well as by a tunnel 50′ long, which will cut the vein in 20′ more. A small Kendall, 1-stamp mill, 900 lbs. weight, run by a gasoline-engine, is placed near the mouth of the tunnel for prospecting. Six men are employed. J. Helmers et al., of Georgetown, owners.

*Montezuma Mine* (Quartz).—See our XIIth Report, p. 118. It is ½ mile N. of Nashville. Idle. J. C. Heald, of Nashville, owner.

*Mooney Mine* (Drift).—See our XIIth Report, p. 118. It is 8 miles E. of Placerville, on an ancient lava-capped channel. — Mooney, of Tyffe, owner.

*Morey Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 178, 178, and 118. It is 1 mile W. of Grizzly Flat, and adjoins the famous Mount Pleasant on the north. It is said that a San Francisco company is about to develop it. Idle. E. R. Morey, of Grizzly Flat, owner.

*Mount Gregory Mine* (Hydraulic).—It is 3 miles E. of Volcanoville, at 3,200′ elevation, and comprises 160 acres, on the white gravel channel. The gravel bank is from 20′ to 25′ high, with 8′ of gravel carrying considerable clay and cement capping. About ¼ acre has been worked the past season, the bowlders being blasted. About 190 inches of water is taken from the Daggett ditch and delivered, under 95′ pressure, through 300′ of 15″ and 7″ pipe to a No. 1 giant with a 3″ nozzle. The water season lasts four to five months. Two strings, 60′ and 26′ long, of 28″ flume are used, dumping into Missouri Cañon behind two restraining dams, 60′ long, built of logs and brush. Four men are employed. A. Phelps and — Porter, of Georgetown, owners.

*Mount Hope Mine* (Quartz).—See our VIIIth Report, p. 178. It is on the south bank of the North Fork of the Cosumnes River, 3 miles N. of Grizzly Flat. Opened by tunnels. Mine and 10-stamp water-power mill idle. A Cleveland, Ohio, company, owner.

*Mount Pleasant Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 178, 178, and 118. It is ¾ mile W. of Grizzly Flat. Idle. J. D. Hague et al., of New York, owners.

*Murzo* (*Brass'*) *Mine* (Drift).—See our XIIth Report, p. 119. It is on Buckeye Hill, 2 miles from Volcanoville. A. E. Brass, of Georgetown, owner.

*Nashville* (*Havilah or Hendy*) *Mine* (Quartz).—See our XIIth Report, p. 119. It is at Nashville, at 850′ elevation. Since our last Report the mine has been reopened to the 650′ level, and some stoping done between fifth and sixth levels, but is again closed temporarily. A new 20-stamp steam-power mill has been built and is well supplied with gold-saving

apparatus. The Diamond Ridge Ditch Co. is about to extend its lines 10 miles, and will furnish water, under 650′ pressure, for the hoisting works and mill. Judge George E. Williams, of San Francisco, owner.

*New El Dorado Mine* (Quartz).—See our XIIth Report, p. 119. It is 2½ miles N.E. of Greenwood. Idle. W. N. Martin, of Oakland, Alameda County, owner.

*New Garibaldi Mine* (Quartz).—It is 2½ miles W. of Greenwood, at 1,975′ elevation. The vein, averaging 8′ in width, strikes N.W. and S.E., and dips E., between slate walls. The developments consist of a 170′ tunnel, to cut the vein, besides five shallow shafts along the outcrop, not over 40′ deep. When the tunnel reaches the vein it will give 230′ of backs. The quartz is of a rotten character, and the pay-shoot has been proved to be 400′ or more in length. A Kinkaid mill of 25 tons capacity, to be run by steam-power, will be placed below the mouth of the tunnel. Four men are employed. J. W. Scott, of Los Angeles, and J. T. Smith, of Greenwood, owners.

*Oak Mine* (Quartz).—See our XIIth Report, p. 119. It is 5 miles S.W. of Grizzly Flat. Idle. J. Ryan, of Grizzly Flat, owner.

*Ohio Mine* (Quartz).—It is 1 mile E. of Greenwood, at 1,950′ elevation. The vein strikes N. of W., and dips 51° N., between slate walls. In an open cut on the cropping, extending over 100′, three other quartz stringers were cut; 75′ distant was stringer No. 1, 18′ beyond was No. 2, and 20′ farther, No. 3 was cut. In sinking the 4′x 6′ main working-incline, which had reached a depth of 150′ in June last, it was started on the pitch of the foot-wall of the main vein, but in keeping this pitch, passed entirely into the hanging-wall, so that at 100′ depth, where the shaft cut stringer No. 1, the foot-wall is 35′ distant, and at 125′, where stringer No. 2 was encountered, it is 45′ to the foot-wall. The shaft is being continued to a depth of 250′. Where the stringers were encountered they had increased from mere stringers to 3′ and 4½′ in width. The quartz carries 1½% of a good grade of sulphurets, and frequently shows free gold. The hoisting is done by a 15 H.P. engine, and the water is handled with buckets, 6 per hour. Six men are employed. An incorporated company, of San Francisco, owner; C. Kinney, of Greenwood, superintendent.

*Ohio Mine* (Quartz).—See our XIIth Report, p. 119. It is 1 mile S.W. of Grizzly Flat. Idle.

*Old Jasper Mine* (Quartz).—It is 9 miles N.W. from Shingle Springs, at 1,100′ elevation, and comprises 80 acres, under agricultural patent. There are two parallel veins, 3′ to 4′ wide, with a N. and S. strike in grano-diorite. On the bank of Weber Creek a tunnel has been driven 200′ on the vein and stoped out to the surface, and an incline started from the surface through the old works. The mine is under bond, and idle at present. J. Jurgens, of Lotus, owner.

*Omo Mine* (Quartz).—It is 8 miles E. of Fairplay, at 3,440′ elevation, and comprises 60 acres. The vein strikes N. and S., and at the surface dips W., but turns E. in depth. The formation is grano-diorite, and the vein is from 18″ to 30″ wide. The surface on the outcrop is being piped off and is proving remunerative in quartz gold. The quartz carries 1% sulphurets. There is a 150′ tunnel and a 64′ shaft. Water is supplied from the Empire Ditch Co., through 230′ of 7″ pipe under 100′ pressure, using 50 miner's inches, at a cost of 5 cents per inch. The 16″ flume is 125′ long, set on a ½″ grade to the foot, and is

preceded by a rock cut on a 10″ to 12″ grade, and lined with pole riffles. Two men are at work. G. W. Mock, of Omo Ranch, owner.

*Oregon Mine* (Quartz).—See our VIIIth Report, p. 182. Adjoins the Rose, in the southern part of Placerville. See Placerville Gold Quartz Mining Co.

*Oro Fino Mine* (Quartz).—See Big Cañon.

*Pacific Mine* (Seam Diggings).—See our XIIth Report, p. 120. It is on Cañon Creek, at 2,600′ elevation, and comprises between 6 and 7 acres. Worked by blasting down to the bank and washing the rocks, using water from North Cañon Creek, through ¾ mile of ditch. Four men are employed. Barklage Estate et al., of Georgetown, owners.

*Pacific Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 183, 173, and 120. It is developed to a depth of 1,000′, and a large ledge of $2 quartz exposed. Idle. See Placerville Gold Quartz Mining Co.

*Padre Mine* (Quartz).—See our XIIth Report, p. 120. It is 2½ miles N. from Nashville. Idle. J. M. Vandergrift, of Nashville, owner.

*Payne Gravel Mine* (Drift).—See our XIIth Report, p. 120. It is 3 miles S. of Grizzly Flat. Idle. J. M. McClean, of Grizzly Flat, owner.

*Philadelphia and Gold Note Mines* (Quartz).—See our XIIth Report, p. 120. They are in T. 8 N., R. 13 E., 8 miles S. of Grizzly Flat, at 3,760′ elevation, and comprise four claims, designated the *Gold Note*, *Philadelphia*, *Whitehall*, and *Woolara;* two are 1,500′ by 600′, and the other two are 1,400′ by 600′. Since our last Report the second shaft on the Philadelphia has been sunk to a depth of 125′ to connect with the tunnel, while on the Gold Note the shaft has been sunk to a depth of 145′ and a drift run 340′ on the vein; also, a 10′ cross-cut made. The vein in this drift shows 5′ wide. A sawmill of 10,000 ft. B.M. capacity per day has been erected, and a 4″ Cornish jackhead pump placed in the Gold Note shaft, to run with either steam or water power. There is a 6′ Pelton wheel, using 40 miner's inches of water, under 320′ head, delivered through 1,700′ of 11″ and 7″ pipe-line. The steam hoist is 60 H.P. The changes in the 10-stamp mill are confined to the introduction of movable aprons. The shaft will be straightened and sunk 150′ to 200′ farther, and drifts run by Septimus Mining Co., which is working it under bond. Nine men are employed. J. B. Polk and Parker Bros., of Omo Ranch, owners; R. S. Raw, of Placerville, superintendent.

*Pine Hill Gold and Silver Mining Co.'s* (*Unity*) *Mine* (Quartz).—See our XIIth Report, p. 121. It is 5 miles N.W. from Shingle Springs, at 1,060′ elevation, and comprises 3,000′ by 300′. The vein strikes N. and S., dips W. near the surface, but turns in depth to 70° E. The walls are slate and greenstone, and 20′ apart, carrying 6′ of quartz. There is a 4′x 10′ double-compartment shaft, 100′ on incline, then 100′ perpendicular. At the 200′ level, drifts extend 125′ E. and 60′ W. from the shaft, and a cross-cut 140′ northward. The plant consists of a steam hoist and 4″ Dow plunger pump, with 2″ discharge pipe. Eight men are employed. An incorporated company, of No. 1021 Tenth Street, San Francisco, owner; C. Milly, manager.

*Placerville Gold Quartz Mining Co.'s Mines* (Quartz, Hydraulic, and Drift).—The quartz mines extend from a mile S. of the American River almost continuously to Weber Creek, a distance of 3 or more miles. The following are the principal ones: *Black Bear*, *Brown Bear*, *Chester*, *Cinnamon Bear*, *Epley*, *Faraday*, *Gross*, *Henrietta*, *Ida*, *Keegan*, *Mammoth*,

*Old Harmon, Oregon, Oregon Extension, Pacific, Rose, True, Van Hooker, White Bear, Young Harmon*, etc. They are supposed to be all on the Mother Lode belt. Besides, the company owns hydraulic mines in Chili Ravine, on Spanish and Nigger hills, White Rock, etc.; also, drift mines on Cedar Ravine, etc. It also owns the El Dorado Water and Deep Gravel Mining Co.'s ditch system. All the mines have been idle for the past three or four years. The company is an English one. A. D. Henderson, of Placerville, superintendent.

*Plattsburg Mine* (Quartz and Placer).—It is ¾ mile N. of Georgetown at 2,700′ elevation, and comprises 22 acres. The vein strikes N. and S., dips 65° E., and is from 1′ to 4′ wide, between slate and porphyry walls. The quartz carries coarse free gold, with a few sulphurets. This is a new discovery, showing two pay-shoots on the surface, 200′ and 70′ long, respectively. Besides the quartz, there are 7 acres of gravel on the Mameluke channel, carrying nugget gold, the largest piece found weighing $427. Two men are employed opening the claim. A. J. & R. S. Wilton, of Georgetown, owners.

*Pleasant Valley Mine* (Quartz).—It is ½ mile E. of Pleasant Valley. Developed by 480′ of tunnel and two shafts, 80′ and 140′ deep. Idle. H. S. Morey, of Placerville, owner.

*Pocahontas Mine* (Quartz).—It is 2½ miles S. of El Dorado, at 1,700′ elevation, and comprises 6,000′ by 800′ of mining ground, besides 350 acres of land. The vein strikes N. of W., and dips 38° E. There are two veins 300′ apart, designated the *Empire* and the *Pocahontas*, both dipping E., the former at the steeper angle. The formation is quartz porphyry on the surface, but at a depth of 495′, slate is encountered. The *Pocahontas* vein is from 4′ to 9′ wide, the *Empire* 20″. The quartz in the depth carries 2% to 3% sulphurets. At 5′ x 12′ three-compartment incline shaft is 300′ deep; at present partially filled with water; two vertical shafts with double compartments are respectively 400′ and 135′ deep. A steam hoist will soon be placed on the three-compartment shaft, and a temporary pump, of 10,000 gals. per hour capacity, to be replaced later by a Cornish jackhead pump. A tramway, 700′ long, leads to a 5′ Huntington steam-power roller mill furnished with two Seymour concentrators. Seven men are employed. An incorporated company, of No. 35 Wall Street, N. Y., owner; James Richards, of El Dorado, superintendent.

*Pyramid Mine* (Quartz).—See our XIIth Report, p. 121. It is 4 miles N.W. of Shingle Springs, at 1,100′ elevation, and comprises 30 acres. The vein strikes N. 20° W., and dips 40° E. Near the north end of the claim a second vein joins the former at an acute angle. There is a pronounced pyramid-shaped outcrop to the vein from 18′ to 30′ across, which is furnishing a portion of the milling ore. The pay-shoot has been proved 500′ in length, carrying 1½% to 2% sulphurets. On the mill level a tunnel has been driven on the vein 100′ below the outcrop, the back portion of which has caved; the front 150′ are connected by a chute with the croppings, down which the ore is passed to the mill. On the north end of the claim is a vertical 6′x 15′ three-compartment shaft, now 50′ deep, from which a cross-cut is started. It is supplied with a horse-whim, which is to be discarded for a large steam hoist. The 5-stamp water-power mill, with 550-lb. stamps, is run at 105 drops of 6″, crushing 8 tons per day. The water is taken from Dry and Indian creeks, through 1 mile of ditch of 100 miner's inches capacity, and delivered to a 4′ Knight wheel under 40′ head. Six men are employed.

yramid Mine and Milling Co., owner; L. J. Gilman, of Shingle prings, superintendent.

*Quartz Cañon Mine* (Placer).—It is in Quartz Cañon, 1¼ miles from olcanoville, at 2,680′ elevation. The cañon is being worked for the uartz debris by the use of a "self-shooting" reservoir, which receives 00 miner's inches from the Daggett ditch, filling the reservoir in ¾ our and emptying in three minutes. The cut is worked from 30′ to 40′ ide, and in the deepest portion the bank is 30′ high. The bowlders re blasted. No sluice-boxes are used, the bed of the cut being lined ith poles for 200′ in length. The water season lasts six months. our men are at work. J. Helmers et al., of Georgetown, owners.

*Rainbow* (*Wild West*) *Mine* (Quartz).—It is 1¼ miles N.W. from arden Valley, at 2,220′ elevation. The vein strikes N. and S., and dips 5° E., between a porphyry hanging-wall and a slate foot-wall, with a idth of 23′ of vein matter, only 6′ of which, next the hanging-wall, pays extract. An open cut of 300′ has been run on the outcrop of the vein, nd a 4′x 8′ double-compartment shaft started, which was in June last 25′ eep. A small 4-stamp prospecting mill, with 500-lb. stamps, is on the roperty, driven by a 5′ wheel with Pelton buckets, taking 15 inches of ater from the California Ditch Co., and delivered under 101′ pressure, hrough 260′ of 9″ and 5″ pipe. Five men are employed. J. Ramsell and C. M. Root, of Garden Valley, owners.

*Rattler Mine* (Quartz).—See our XIIth Report, p. 122. It is on the outh side of Weber Creek, 2½ miles S. of Placerville. Only assessment ork. John Dench and James Keyser, of Placerville, owners.

*Red Rover Gold Mine* (Quartz).—See our XIIth Report, p. 122. It is miles S. of El Dorado and a little E. of Logtown. Idle. E. Harper t al., of El Dorado, owners.

*Ribbon Rock Mine* (Quartz).—See Miller.

*Rocky Bar Mine* (Quartz).—See our XIIth Report, p. 122. It is ½ nile E. of Greenwood. Assessment work only. S. Kaiser, of Greenwood, wner.

*Roscoe Mine* (Quartz).—It is 3 miles N.E. from Latrobe, at 900′ elevaion. This is an old mine which is being prospected with a core drill nachine, prior to reopening. The revolving tubular drill is operated y steam, using for cutting, chilled steel shot of the size of bird-shot. They are charged through the water about once an hour and fall to the ottom of the drill. To date the bore-hole was 190′ deep; the first 40′ lown to solid rock being cased with 5″ iron pipe. The formation is greenstone and slate. The object of the drill-hole is to prove if the vein, which dips W. on the surface, reverses the dip below. The vein strikes N. and S., and dips W.; the former workings showing a 12′ vein. The present rate of drilling, employing 4 men, is from 4′ to 5′ per day nly. Senator J. P. Jones, of Nevada, owner.

*Rose Mine* (Quartz).—See our VIIIth Report, p. 182. It is in Placerville. See Placerville Gold Quartz Mining Co.

*Rosencranz Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 171 and 176. It adjoins the Taylor or Idlewild Mine on the south, and it is reported that the pay-shoot from the latter enters the Rosencranz ground at the 500′ level. There is an old steam hoist and 10-stamp mill on the property. After several years of litigation the State Supreme Court has decided that the owners are H. S. Morey and Richard Rowland, of Placerville, and Rinaldo Fillipini, of Garden Valley.

*Rubicon Mine* (Drift).—It is 2½ miles W. of Volcanoville, at 3,100 elevation. It was formerly worked as a hydraulic mine, but during th past season a tunnel was started in bedrock and driven 110′, till i pitched away, beginning 85′ from the mouth. Some breasting has beer done on soft gravel, 4′ high and 27′ wide. One hundred inches of fre water for washing is obtained from Missouri Cañon, which is delivered through ½ mile of ditch and 1,700′ of 22″ pipe, under 40′ pressure. The 12″x 16″ flume is about 400′ in length. Three men are employed. — Barklage et al., of Georgetown, owners.

*St. Lawrence Mine* (Quartz).—See our XIth Report, p. 202. It is 1 mile N. of Kelsey. It was worked years ago to a depth of 700′, where the ledge faulted. Formerly had a steam hoist and a 20-stamp mill. Under bond to a Milwaukee incorporated company, which is sinking a new shaft by steam-power. Mierson & Alderson, of Placerville, owners. Edward Bind, superintendent.

*Salisbury Mine* (Quartz).—It is 5 miles E. of Placerville, at 2,100′ elevation; it comprises 259 acres, and adjoins the Grand Victory on the west. The vein strikes N.E. and S.W., and dips 70° E. It has but recently been opened; the outcrop of the ore-body is being stripped for milling, while a double-compartment incline shaft is being sunk at an angle of 80° E., which had reached 40′ depth in June. A mill, containing a Gates crusher, two 5′ Huntington mills, and a Seymour centrifugal concentrator, calculated for 40 tons capacity per day, has been erected adjacent to the hoisting works, the whole plant being run by steam. Fifteen men are employed. Salisbury Mining Co., owner; Monroe Salisbury, manager.

*San Martine Mine* (Quartz).—It is 1¼ miles N.W. of Greenwood, at 1,900′ elevation. The 20′ vein strikes N.W. and S.E., and dips 60° N.E., between a greenstone foot-wall and a slate hanging-wall. While the main vein is apparently barren, the black slate hanging-wall carries rich seams and veinlets of quartz, and the slate itself is well mineralized. The outcrop is being sluiced off, and an 80′ tunnel has been driven on a side vein. The California Ditch Co. supplies 50 miner's inches of water for sluicing. Two hundred feet of 20″ flume, set on an 18″ grade per 12′, are used. Two men are employed. Ed. Hummel, of Greenwood, owner.

*Santa Rosa Mining Claim* (Drift).—It is in T. 18 N., R. 11 E., 1½ miles E. of Volcanoville, at 3,200′ elevation, and comprises 300 acres on the blue channel, which has a N.E. and S.W. course and is lava-capped, extending 1 mile across from rim to rim on the surface. A tunnel is being driven through the rim on south side of ridge, which at present has reached 718′ in length, and will require to be extended 400′ to 500′ to reach the gravel channel. Formerly the workings were along the east rim. The gold is variable in character. Wash water is supplied from the tunnel and neighboring springs. The mine is temporarily closed. An incorporated company, of Santa Rosa, Sonoma County, owner; A. J. Wilton, of Georgetown, superintendent.

*Schneider Mine* (Quartz).—See Mathenas Creek.

*Sharp Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 194 and 123. It is 5 miles E. of Placerville, at 2,400′ elevation. Mine and 10-stamp steam-power mill are idle.

*Snow Bros.' Mine* (Hydraulic).—It is 1½ miles N.E. from Newtown and 8 miles E. of Placerville, at 2,500′ elevation, and comprises 600 acres, held partly under agricultural patent. The gravel is cemented and

orked from two different pits, about ½ mile apart. The upper one is 0′ deep, with from 10′ to 20′ of gravel, capped with loam; the second it has a 200′ face, 25′ high, capped with cement and lava, with 5′ of ravel on the bedrock. The gold is coarser in the second pit, but not uite as high grade as in the upper one. The bowlders are removed by lasting. The gravel should be milled. During the last season, extending over six months, an acre of ground has been worked. Water is btained from the El Dorado Water and Deep Gravel Mining Co., and s delivered through two pipe-lines, 2,500′ and 2,000′ long, under 250′ ressure, to the giants. The 2′ flumes in the upper pit have a length of ,200′ in two sections; the first with a grade of 10″ per 16′ box, the econd on a 16″ grade to 16′ box; both paved with 8″ block riffles. The rade of the two sections in the lower pit flumes is 6″ to 16′ box. Their ength is 100′ and 300′, respectively. The dump is into Weber Creek ehind a log and brush dam 225′ long and 30′ high. Five men are mployed. It is reported that an Eastern company has purchased it. now Bros., of Newtown, owners.

*Slager Mine* (Quartz).—See our XIIth Report, p. 123. It is 4 miles N. of Greenwood. Idle. John Wade et al., of Oakland, owners.

*South Extension of Ohio Mine* (Quartz).—It is 1½ miles E. of Greenwood, at 1,900′ elevation. The vein strikes E. and W., and dips 50° N., between slate walls. Operations have only recently been started, comprising to date a 100′ tunnel, which will require to be extended 200′ farther to reach the vein; a stringer of quartz has been passed through. Two men are at work. W. Board, of Greenwood, owner.

*Spanish Mine* (Hydraulic).—See our XIIth Report, p. 123. It is ½ mile N.W. of Greenwood, on the "seam diggings" belt. Idle. M. M. Howe, of Greenwood, owner.

*Springfield* (*Church Union*) *Mine* (Quartz).—See our VIth Report (Part II), p. 43. It is 3 miles S. from El Dorado, at 1,180′ elevation, comprising three claims. The two veins, the *Church Union* and the *Cosumnes*, strike N. and S., and dip 80° E., and average 4′ to 10′ between slate walls. After a period of idleness, pay-ore was found near the west side of the claim, and a new 5′x 8′ shaft has been started on the east or Cosumnes vein, and provided with a small steam hoist. In June last the shaft had attained a depth of 40′, where a drift was being run on the pay-shoot. A Kinkaid mill was erected, and run a short time with water obtained from the Diamond Ridge Ditch Co. A 20-stamp mill is to be substituted for it immediately. Ten men are employed. Union Gold Mining Co., owner; A. Harpending, of El Dorado, manager.

*Standard Mine* (Quartz).—See our XIIth Report, p. 123. It is across the American River from, and ½ mile N. of, Coloma. G. Schulz et al., of Coloma, owners.

*Starlight Mine* (Quartz).—See our XIIth Report, p. 123. It is 2½ miles S. of El Dorado, at 1,720′ elevation, and comprises two claims. The vein strikes a little W. of N., dips 40° E., and is about 3′ wide. A 10-stamp steam-power mill has been erected this summer, the steam hoist put in good condition, and a branch of the Diamond Ridge Ditch Co.'s system extended to the mine, to furnish battery and boiler water. Two men are at work. Starlight Mining Co., of No. 206 Sansome Street, San Francisco, owner; A. Blanc, of El Dorado, superintendent.

*Stewart Mine* (Drift).—See our Xth and XIIth Reports, pp. 180 and 123. It is 1½ miles S.E. of Placerville. The mill has been moved to Grizzly Flat. Idle. John Melton, of Placerville, owner.

*Stillwagon* (*St. Lawrence*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 179 and 123. It is 7 miles E. of Fairplay, at 2,900′ elevation, and comprises two claims, designated the *Golden Link* and the *Stillwagon*. Since our last Report a tunnel has been started on the Golden Link ground. Three men are employed. S. A. Laine, of Omo, owner.

*Stuckslager* (*Sam Sim's*) *Mine* (Quartz).—See our VIth and XIIth Reports, pp. 43 and 124. It is on Granite Creek, 1 mile S. of Lotus, at 825′ elevation. The vein strikes N. 54° W., and dips 77° S., crossing the formations of greenstone, porphyry, and clay slate, while serpentine lies to the N.W. The quartz varies from a seam to 2′ in thickness, and carries, along the walls and seams, pockets of gold in connection with *roscoelite*, a mineral of rare occurrence. In the vein proper the quartz does not average over $2 per ton. Since our last Report, new parties have taken hold of the property, under bond, and a shaft has been sunk 80′ below the main tunnel, 286′ from the mouth, following the hanging-wall. A small steam hoist and a Worthington duplex pump have been installed, and some stoping done near the upper portion of the shaft. The main tunnel has also been extended to 426′ in length, the breast being 127′ perpendicularly below the outcrop. The rich *roscoelite* is worked in a hand-mortar. Ten men are employed. W. B. McKinney and C. H. Grube, of Lotus, owners; W. E. Everson, of Lotus, superintendent.

*Studhorse Mine* (Quartz).—It is 2 miles W. of Greenwood, at 2,000′ elevation. The vein strikes E. and W., and dips 30° N., between slate walls 9′ apart. The quartz shows free gold, and carries 1½% of sulphurets of good grade. There are two shallow shafts, 30′ and 40′ deep, sunk on the vein. Two men are at work. J. T. Smith and J. C. Shepard, of Greenwood, owners.

*Sugarloaf* (*Monarch, Hermitage*) *Mine* (Quartz).—See our XIIth Report, p. 124. It is 2½ miles N.W. of Nashville, at 1,550′ elevation. The vein strikes N. and S., and dips slightly E., between greenstone and slate walls, carrying 5′ of quartz. The present workings consist of a 60′ tunnel and a 270′ shaft, supplied with steam hoist and pump, in the nature of prospect work. A very large pocket of gold was taken out the past year. Two men are employed. Dr. A. C. Smith, of Portland, owner.

*Sunday Mine* (Quartz).—See our XIIth Report, p. 124. It is 1½ miles W. of Grizzly Flat. Assessment work only. Mrs. M. Jeffrey et al., of Grizzly Flat, owners.

*Sunrise Mine* (Quartz).—It is 1 mile N.E. of Kelsey, at 2,000′ elevation, and comprises 153 acres, with 160 acres of timber land, railroad title. There are three parallel veins on the property, one of which is largely composed of spar. They strike N. and S., and dip E.; No. 1 is 9′; No. 2, the spar vein, is 30′; and No. 3 is 15′ thick; all three are cut by a tunnel, 320′ long, which turns both ways on No. 3 a short distance. The country rock is slate, with steatite next to the spar vein. The entire depth on the vein gained by the tunnel is only 35′. On No. 3 vein a shaft has been started on the north end of the claim and is now 40′ down, while on No. 1 a 50′ shaft is on the south end of the claim. This vein is supposed to be the same as the Dalmatia. From the main tunnel a tramway, 620′ long, connects with a 10-stamp water-power mill, with 800-lb. stamps, which is idle at present. The mill is fur-

lished water from the California Water Co., through 200′ of 11″ pipe, nd delivered to a 5′ Pelton wheel. A water-right on Rock Creek elongs to the mine, and it is intended to utilize it to generate electric ower and bring it 1½ miles to the mill. Two men are at work. S. F. Voodward, of Clipper Gap, Placer County, owner.

*Superior* (*Tin-cup*) *Mine* (Quartz).—See our VIIIth and Xth Reports, p. 187 and 172. It is 3 miles S. of Placerville. It is provided with a team hoist and a 10-stamp water-power mill, deriving water, through ,400′ of 11″ pipe, from the Diamond Ridge Ditch Co. Idle. W. H. Martin, Crocker Building, San Francisco, owner.

*Tapioca Mine* (Quartz).—It is 2 miles S. of Grizzly Flat, at 3,570′ ele- ation. The vein strikes N. 6° E., and dips W., but it is broken over on op; the formation is porphyry and mica schist, and the vein makes 6′ n width. The developments are made through tunnels, the longest eing 200′ to the vein, and drifted 10′ thereon. On about the same level s a second tunnel 70′ long. A water-right belonging to the property akes water from Steeley's Fork of the Cosumnes River, through 1½ niles of ditch, 3½′ wide on top, 2½′ deep, 18″ wide at bottom, with a rade of 16′ per mile, and of 400 miner's inches capacity, which fur- ishes 80′ pressure on the ground. Two men are at work. J. H. Barker, . H. Stout, and G. W. Stout, of Grizzly Flat, owners.

*Taylor Mine* (Quartz).—See Idlewild.

*Texas Hill Mine* (Drift).—See our XIIth Report, p. 124. It is 2½ niles E. of Placerville, and belongs to the Placerville Gold Quartz Mining Co. Idle.

*Toll House Mining Co.'s Mine* (Drift).—See our Xth Report, p. 179. t is at Smith's Flat, 2½ miles E. of Placerville, and is east of and upon he same channel as the Benfeldt. It has been worked intermittently luring past few years by a Cleveland, Ohio, company, which has erected water-power hoist and sunk a shaft. W. P. Stanley, of Placerville, uperintendent.

*Treat Mine* (Quartz).—See our VIIIth Report, p. 178. It is 2½ miles N. of Grizzly Flat, at 3,400′ elevation. It is an old property being reopened; the vein strikes N. and S., and dips W., in grano-diorite. The old tunnels are being cleaned out prior to further exploiting. Mrs. John D. Treat, of Oakland, owner.

*Trench Mine* (Quartz).—See our XIIth Report, p. 125. Idle. Heirs of J. Trench, of New York, owners.

*True Consolidated Mining Co.'s Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 180 and 125. It is 1 mile N. of Placerville. Mine and 10-stamp water-power mill idle. John Melton, agent.

*Try Again* (*Last Chance*) *Mine* (Drift).—It is 3½ miles E. of Placer- ville, in Sec. 15, T. 10 N., R. 11 E., at an elevation of 2,100′, and com- prises 400 acres, on the same channel as the Linden and Tokey mines. A drift has been run 1,500′ N. of E., in the bedrock, connected at the 1,000′ station with the surface, 213′ above, by an upraise through bed- rock and lava. Usually 4 men are at work; temporarily idle. Charles Varozza, of Placerville, owner.

*Tullis* (*Diamond*) *Mine* (Quartz).—It is 2¼ miles S. from Diamond Springs, at 1,645′ elevation. The vein strikes N. and S., and dips 30° E., between quartz porphyry walls, 2½′ apart. From the 4½′x 5′ double- compartment incline, 200′ deep, drifts have been run 125′ south and 50′ north. The south drift connects with the old stopes. The hoisting is

done by horse-whim. Four men are employed. An incorporated company of San Leandro, Alameda County, owner; C. H. Hart, secretary; D. W. C. Morgan, of El Dorado, manager.

*Two Channel Mine* (Hydraulic and Drift).—It is 8 miles N.E. of Georgetown, at 3,200′ elevation, on the Tiederman portion of the property, and comprises 1,100 acres of ground, including the *Kentucky Flat*, *Kenna and Morgan Consolidated*, *Norris or Kates*, *Tiederman*, *Wilton*, and other claims, extending north to Mount Gregory, a distance of 4 miles. Through this ground two channels have been followed, crossing each other on an acute angle at different elevations; they are distinguished as the *white* and the *black* or *blue* channels. The former has a N. and S. course, corresponding to the Michigan Bluff channel, while the latter is considered as a portion of the Breece & Wheeler channel, both of which are on the Forest Hill Divide, Placer County. The former is distinguished from the latter by the absence of any lava bowlders. There are two pits, about 2 miles apart, one on the Tiederman and the other on the Kentucky Flat; the former, worked during the past season, is about 300′ square, bank 20′ high, with 10′ of gravel and lava capping, the gravel being somewhat cemented. The gravel is two thirds bowlders, which are removed by blasting. Two tunnels are being run in the bedrock in the former pit, 6′ high, 3½′ cap, and 6′ spread, carrying 4′ in the bedrock. A No. 3 giant takes water from the California Ditch Co., through 650′ of 11″ pipe, under 150′ pressure. On the Kentucky Flat ground, the hydraulic pit is on the white channel, 2½ acres in extent, with a 25′ bank, carrying from 2′ to 6′ of gravel. Four hundred miner's inches are used here under 170′ pressure. There is a 700′ tunnel also in this portion of the ground. Between the preceding claims is the George Wilton, or Middle Otter Creek claim, where a couple of small pits have been opened on the white channel, but which are not being worked at present. The bank here is shallow and will be piped later. On the Kenna and Morgan Consolidated claims both channels are developed through hydraulic pits on the white channel, and drifts on the black or blue channel. The main drift is 700′ long, 6½′ high, 3½′ cap and carried 4′ in bedrock. The breasts are carried 60′ wide and 3½′ high and both posts and caps, as well as sets, are employed in timbering; the breasters average 3 tons per shift. The gravel from this drift is cemented and is crushed in a 10-stamp water-power mill, with 550-lb. stamps having a capacity of 60 tons per day, using No. 12 wire screen. The water is applied to a 6′ Dodd wheel through a 7″ pipe under 300′ pressure. On the Norris claim an old tunnel is being repaired to reach the black channel. Four miles of graded roads and telephone lines connect the claims. The gold from both claims is coarse. About 40 men are employed. D. W. Marmon, of Indianapolis, Ind., H. E. Picket, of Placerville, et al., owners; D. W. Green, of Georgetown, superintendent.

*Uncle Sam Mine* (Drift).—It is 2½ miles S.E. of Fairplay, at 2,760′ elevation, and comprises 40 acres on an ancient channel. There are two tunnels; the upper one 120′ to gravel, thence 58′ where the bedrock pitched away on an angle of 26°, and thence 44′ on the slope. A second tunnel was then started 100′ perpendicularly below in the granite bedrock, and is now 227′ long, and will have to be extended 135′ to reach the gravel. Six men are employed. An incorporated company, owner; F. Hyde, secretary; R. D. Waggoner, of Uno, superintendent.

*Unity Mining Co.'s Mine* (Drift).—See our XIIth Report, p. 125. is 3 miles N.E. of Placerville. Dismantled. Geo. W. Kimble et al., Placerville, owners.

*Uno Mining Co.'s Mine* (Drift).—It is in T. 8 N., R. 12 E., 3 miles S. of Fairplay, at 2,770′ elevation, and comprises 40 acres on an ancient channel. The main gangway is 350′ long, partly in granite and partly in gravel; there is also a 50′ drift and an upraise. The rims of the channel are from 1,500′ to 1 mile apart. Idle. Willard Gardner, of Sacramento, owner.

*Valdora Mine* (Quartz).—See our VIIIth Report, p. 178. It is ½ mile W. of Grizzly Flat, and adjoins the Mount Pleasant on the south. Idle.

*Van Hooker Mine* (Quartz).—See our VIIIth Report, p. 181. Also see Placerville Gold Quartz Mining Co.

*Vann Mine* (Quartz).—It is ¾ mile N. from Georgetown, at about 2,700′ elevation. Idle. W. D. English and B. Baldwin, of San Francisco, owners.

*Vulture Mine* (Quartz).—It is ¾ mile N.E. of Placerville, at about 2,050′ elevation. It is prospected by a 72′ shaft, connecting at a point 50′ from the surface with a 127′ tunnel. A second tunnel, 52′ lower than the other, is being driven on a porphyry belt, and is now 150′ long. Very rich gold quartz specimens and tellurides are found in it. W. A. Braddock et al., of Placerville, owners.

*Webster Mine* (Quartz).—See our XIIth Report, p. 126. It is in Quartz Cañon, 2½ miles N.E. of Georgetown. Idle. D. C. Webster, of Georgetown, owner.

*Welch Gold Mine* (Quartz).—See our XIIth Report, p. 126. It is ½ mile N.E. of Greenwood. Recently a San Francisco company bonded it, sunk 100′, cross-cutted 150′, and erected a water-power hoist. It is said most satisfactory developments were made, revealing a ledge 3′ to 8′ wide. H. Welch, of Greenwood, owner.

*White Bear* (Quartz).—See our VIIIth Report, p. 182. See Placerville Gold Quartz Mining Co.

*Wild West Mine* (Quartz).—See Rainbow.

*Wilton Mine* (Drift).—See Two Channel.

*Woodside Mine* (Quartz).—See our XIIth Report, p. 126. It is in Georgetown. C. M. Fitzgerald, of Georgetown, owner.

*W. W. Mine* (Drift).—See our XIIth Report, p. 126. It is on Cement Hill, 4 miles N. of Georgetown. Idle. R. S. Wilton, of Georgetown, owner.

*Zentgraf Mine* (Quartz).—See our VIIIth Report, p. 200. It is 8 miles E. of Newcastle, Placer County, close to the American River, at 450′ elevation, and comprises two mining claims and 111 acres. The vein strikes N.W. and S.E., and dips 40° to 48° S.W., through a granodiorite formation into slate, and increases in width from 12″ on the surface to 3′ in the lower workings. The quartz carries 1¾% of iron sulphurets, with some galena. The mine is worked through a 4′ x 9′ double-compartment incline, 530′ deep. A self-dumping skip, of 1-ton capacity, raises the rock on a 37″ track to a grizzly with 1½″ spaces, which delivers it to a Dodge rockbreaker of 12 tons per hour capacity; the skip is also used for handling the water. A 9″ x 12″ steam-engine of 35 H.P. runs the hoist. An adit, 500′ long, which was the former working outlet, taps the incline at the 300′ level and turns a distance of 1,280′ on the vein; from this level to the surface the ground is pretty

well stoped. The next level below, No. 2, or the 400′ level, has drift extending 291′ N. and 295′ S. on the vein. On No. 3, or 500′ level, drift run 225′ N. and 295′ S. The principal stations in the mine, as well a all the buildings, are lighted by electricity, using a dynamo with a capacity of 250 lights of 16 candle-power. The mill is in the imme diate vicinity of the hoist, and the entire work from the time th ore leaves the skip is by gravity. The 20-stamp mill carries 1,000-lb stamps, making 95 drops per minute of $4\frac{1}{2}$″, with 4″ discharge through a 30-mesh screen of punched tin, giving a capacity of 80 tons per day Suspended Challenge feeders, operated below the lower guide from th center stamp, without a bumper rod, and fed automatically through chutes from the ore-bin, are used. The apron plates are 5′ wide, 20 long, and are set on a grade of $1\frac{3}{4}$″ to the foot. The concentration i effected with four Woodbury concentrators, 6′ wide and 9′ long. Th mill is further provided with an iron clean-up barrel, and an assaying and melting department. The power is furnished by a 12″ x 30″ Corlis engine of 70 H.P. An automatic tailings-sampler, similar to that in use at the Idlewild (see illustration, p. 146), is employed. The entire mill plant and the method of working may be taken as a standard model of the best California mill practice. There are 80 men employed 40 of whom are in the mine. E. W. Chapman, of Greenwood, owner T. T. Chapman, of Newcastle, Placer County, superintendent.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Alpine | Water | 10 | 1,000 | 35 | 3 | Duncan | | | | |
| Aultman | " | 10 | 850 | 16 | | | | | | |
| Baltic* | " | 10 | | | | | | | | |
| Big Cañon | " | 30 | 1,200 | 70 | 6<br>3 | Frue<br>Tulloch | 1 | 5 tons. | | |
| Big Jim | Steam | 2 | 850 | 10 | 1 | Johnson | | | | |
| Big Sandy | Water | 10 | 750 | | | | | | | |
| Blue Bank | " | 2 | 250 | 1 | | | | | | |
| Boulder | " | 10 | | | | | | | | |
| California Jack | " | 10 | 1,000 | 15 | | | | | | |
| Chili Ravine | " | 10 | 550 | 60–70 | | | | | | |
| Church | " | 10 | 950 | 24 | 4 | Frue | | | | |
| Crystal | " | 8 | 650 | | | | | | | |
| Crystal | " | 10 | 650 | | | | | | | |
| Daily & Bishop | " | 10 | 750 | | 2 | Gold Bug<br>Chief. | | | | |
| Dalmatia* | Electric | 10 | 850 | | | | | | | |
| Darling | Steam | 10 | | | 2 | Frue | | | | |
| Davidson | " | 20 | | | | | | | | |
| Eagle King | Water | 10 | 650 | 16 | | | | | | |
| Esperanza | " | 20 | | | | | | | | |
| Eureka | " | 10 | | | | | | | | |
| Flagstaff | " | 10 | | | | | | | | |
| Fort Yuma | " | 10 | | | | | | | | |
| Franklin | " | 10 | 600 | 60 | | | | | | |
| French Hill | " | 10 | 750 | | | | | | | |
| Gentle Annie | " | 10 | 750 | 20 | 2 | Frue | | | | |
| Gopher Boulder* | " | 20 | 750 | | 8 | Frue | | | | |
| Grand Victory | " | 50 | 1,000 | 100 | 9<br>5 | Frue<br>Triumph | 1 | 3 tons. | | |
| Griffith & Bryant | " | 5 | 350 | | | | | | | |
| Havilah | Steam | 20 | 1,000 | 60 | 6 | Hendy | | | | |
| Idlewild* | Water | 40 | 950 | 110 | | | | | | |
| Josephine | " | 20 | 750–850 | 50 | 8 | Triumph | | | | |
| Lady Emma | " | 10 | 850 | | 2 | Frue | (One Gold King Amalgamator.) | | | |
| Larkin | Steam | 5 | | | | | | | | |

MILLS IN EL DORADO COUNTY—Continued.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Last Chance | Water | 4 | 550 | 4 | | | | | | |
| Linden | " | 10 | 500 | 60–80 | | | | | | |
| Log Cabin | " | 5 | 900 | 15 | | | | | | |
| Mammoth | " | 10 | 750 | | | | | | | |
| Manzanita Queen | " | 2 | | 8 | | Seymore | | | | |
| Melton | Steam | 20 | | | 8 | Frue | | | | |
| Montana* | " | 1 | 900 | 3 | | | | | | |
| Montezuma | Water | 10 | 650 | | | | | | | |
| Morey | " | 5 | 600 | | | | | | | |
| Mount Pleasant | Steam | 10 | | | 4 | Frue | | | | |
| Oak | Water | 5 | 800 | | | | | | | |
| Oregon | " | 10 | 750 | 15 | 4 | Frue | | | | |
| Pacific | " | 20 | 800 | 30 | | | | | | |
| Padre | " | 5 | 650 | | | | | | | |
| Philadelphia and Gold Note | " | 10 | 650 | 8 | | | | | | |
| Pocahontas* | Steam | 10 | | | | | | | | |
| Pyramid | Water | 5 | 550 | 8 | | | | | | |
| Rainbow | " | 4 | 500 | 20 | | | | | | |
| Rosencranz | Steam | 10 | 800 | | | | | | | |
| Rogers Gravel | Water | 10 | 500 | 130 | | | | | | |
| Sharp | Steam | 10 | | | | | | | | |
| Starlight | " | 10 | | | | | | | | |
| Stillwagon | Water | 5 | 850 | 10 | 1 | Woodbury | | | | |
| Superior | " | 10 | 750 | 22 | 4 | Frue | | | | |
| Sunrise | " | 10 | 800 | | | | | | | |
| Texas Hill | " | 10 | 750 | 60 | | | | | | |
| True | " | 10 | | | | | | | | |
| Two Channel | " | 10 | 550 | 40 | | | | | | |
| Unity | " | 10 | 375 | | | | | | | |
| Zentgraf | Steam | 20 | 1,000 | 80 | | | | | | |

In addition to stamps, the mills marked with a * have additional capacity, as follows:

RRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN EL DORADO COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. |
|---|---|---|---|---|---|
| ltic | Water | | Cannon Ball | | 3 |
| lmatia | Electric | 1 | Huntington | 5′ | |
| pher Boulder | Water | 2 | Huntington | 5′ | |
| rdscratch | " | | Dyer Cannon Ball | | 4 |
| lewild | " | | Dodge | | 25 |
| ne Star | Steam | | Huntington | 5′ | |
| thines Creek | Water | | Huntington | 5′ | 9–10 |
| ntana | " | | Kendall | | |
| w Garibaldi | Steam | | Kinkead | | 25 |
| cahontas | " | | Huntington | 5′ | 15 |
| lisbury | " | 2 | Huntington | 5′ | 40 |
| aw | Water | | Huntington | 5′ | 10–12 |
| ringfield | " | 1 | Kinkead | 5′ | 10 |

## Fresno County.

The principal revenue of the county is derived from its agricultural, ticultural, horticultural, and stock-raising interests. Fruit of all kinds, nd particularly grapes, are produced in immense quantities. The arid imate necessitates an artificial water-supply, and extensive irrigation ystems and innumerable artesian and pumped wells are the result; on ne other hand, it facilitates the quick drying of fruit, so that it has ade the county the center of the raisin industry of the State. Mining the precious metals is carried on to some extent in the foothills of the ierra Nevada, while coal of good quality, gypsum, and petroleum are roduced in the Coast Range. The recent oil developments seem espe- ally promising. Mineral springs also occur, but are only slightly nproved. The lumber industry is of considerable importance, the total utput for 1895 amounting to 41,000,000 ft. B.M., 40% of which was ugar pine, and the rest yellow pine and spruce. It is brought from the ountains in V flumes with 3′ sides, set on grades of not less than 110′ er mile. The Kings River Flume Co. has a flume 49½ miles long, and ne Fresno Flume and Irrigation Co. has one 41 miles long. Their ombined product in 1895 runs up to 36,000,000 ft. B.M. of lumber.

*Barnes Mine* (Quartz).—See our XIIth Report, p. 127. It lies on Big reek, 5½ miles S.E. of Pine Ridge, at 4,450′ altitude. Idle. G. W. arnes, of Pine Ridge, owner.

*B. & M. Mine* (Quartz).—It is on Dinkey Creek, 10 miles E. of Pine idge, at 5,620′ altitude. The 2′ vein occurs in granite, and dips 30° .E. A tunnel 75′ long has been driven on the vein. The ore is free- illing, and is treated in a horse-power arrastra. James Bridgers, of ine Ridge, owner.

*Big Bar Mine* (Placer).—This lies on Dinkey Creek, 10 miles E. of ine Ridge, at 5,300′ altitude. Water for ground-sluicing is taken from inkey Creek by a short ditch. The gravel is 8′ deep. Mort. Howell, f Pine Ridge, owner.

*Big Sampson Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 07 and 127. It is situated 1 mile W. of Sampson Flat. Idle. Estate f B. H. Sterns, of Visalia, Tulare County, owner.

*Black Jack Mine* (Quartz).—See our XIIth Report, p. 127. It is 1 mil W. of Sampson Flat, and on the same vein as the Big Sampson. Idl A. Hammersley, of Bakersfield, Kern County, owner.

*Blue Rock Mine* (Quartz).—See our XIIth Report, p. 127. It is o Keyes Creek, 3 miles N.E. of Letcher, at 1,500′ altitude. The vein is 2 thick, courses S.E. and N.W., and dips between vertical granite walls The development consists of four shafts, 25′ to 118′ deep. Mrs. S. Craig of Letcher, owner.

*Boyd & Slater Mine* (Placer).—See our XIIth Report, p. 127. It is o Mill Creek, 5 miles N.E. of Dunlap, at 2,500′ altitude. The creek fur nishes water for ground-sluicing. Boyd & Slater, of Dunlap, owners.

*Campbell Mine* (Placer).—It lies on San Joaquin River, 1 mile abov Pollasky, at 475′ elevation, and contains 20 acres. Water for sluicin is taken from the river. James Campbell, of Pollasky, owner.

*Champion Mine* (Quartz).—See our XIIth Report, p. 128. It is o Keyes Creek, 2 miles S.E. of Letcher, at 1,200′ altitude. F. Gross, o Letcher, owner.

*Confidence Mine* (Quartz).—See our XIIth Report, p. 128. It is o Keyes Creek, 2 miles S.E. of Letcher, at 665′ elevation. The vein i 1½′ to 4′ wide, and dips 85° E., between walls of mica slate. Consider able pay-rock has been taken from this vein in former years. It i practically idle at present. A 5-stamp water-power mill, with 650-lb stamps, belongs to the property. E. Loyd, of Letcher, owner.

*Crystal (Weatherby) Mine* (Quartz).—See our XIIth Report, p. 131 It is in Auberry Valley, 2½ miles N. of Auberry, at 1,580′ altitude. Idle Logan Baird et al., of Garfield, owners.

*Crystal Springs Mine* (Quartz).—See our XIIth Report, p. 128. It i on Keyes Creek, 2 miles S.E. of Letcher, at 1,400′ elevation. The vei is 2′ wide, and dips 70° N.E., between granite walls. The developmen consists of a 110′ tunnel along the vein, which contains some 2% of sul phurets. Jos. Vernette, of Letcher, owner.

*Defiance Mine* (Quartz).—See our XIIth Report, p. 128. It is o Keyes Creek, 2 miles S.E. of Letcher, at 1,250′ altitude. The mai tunnel has been extended 50′, and is now 310′ long. The vein average 14″ of quartz, and stands nearly vertical. The country rock is granite F. Gross, of Letcher, owner.

*Dennis Mine* (Placer).—It is on Big Creek, 6 miles E. of Pine Ridge at 4,580′ altitude, and contains 20 acres. Water for sluicing is brough from Big Creek by a 2′ wide ditch, ¼ mile long. The bank is 12′ hig and all gravel. Jim Dennis, of Pine Ridge, owner.

*Emma (Yorton) Mine* (Quartz).—See our XIIth Report, p. 128. I is on Dog Creek, 5 miles S.E. of Letcher, at 1,600′ altitude. Idle. Hug Nipper et al., of Letcher, owners.

*Flinn Mine* (Placer).—It lies on Dinkey Creek, 10 miles E. of Pin Ridge, at 5,620′ elevation. Worked by ground-sluicing. James Flinn of Pine Ridge, owner.

*Gilkie Mine* (Placer).—See our XIIth Report, p. 128. It is at Sampso Flat, at 2,650′ elevation. Worked by ground-sluicing. S. C. Moore, c Dunlap, owner.

*Grubstake Mine* (Quartz).—See our XIIth Report, p. 128. It is on Do Creek, 5 miles S.E. of Letcher, at 1,580′ altitude. The vein consists c 14″ of quartz, in thin seams and hornblende schist, dipping 60° E between syenite walls. Developed by a 30′ shaft. Taylor Young et al of Letcher, owners.

*Hancock Mine* (Placer).—It is on Big Creek, 6 miles E. of Pine Ridge, at 5,200′ altitude, and contains 20 acres. Water for sluicing is brought from the creek by a 2′ wide ditch, ¼ mile long. The gravel is 12′ deep. Ben Hancock, of Pine Ridge, owner.

*Hancock Mine* (Quartz).—See our XIIth Report, p. 129. It lies on Big Creek, 6 miles E. of Pine Ridge, at 5,400′ elevation. The vein contains from 6″ to 2′ of gold quartz, free from sulphurets. It dips 60° N.E., between granite walls. The lower tunnel is 460′ long, and is being extended. The ore is treated in a water-power roller mill of 2 tons daily capacity. A. Halk, of Pine Ridge, owner.

*Henrietta Mine* (Quartz).—See our XIIth Report, p. 129. It is at Temperance Flat, 6 miles N. of Auberry, at 1,260′ elevation. The property embraces three locations: the *Henrietta*, *Hidden Treasure*, and *St. John*. In the latter are three tunnels on the vein, 100′ to 150′ long. The lowest one is being extended on the vein. The quartz is 2″ to 12″ thick, and dips 45° N. The country rock is a coarse, crumbly granite. In the Hidden Treasure is an incline shaft, 70′ deep, and a tunnel to meet it, 80′ long; both on a vein, 6″ to 12″ wide, running parallel with the Henrietta vein. A 2-stamp steam-power mill is on the ground, ready to set up. S. C. St. John and John Albin, of Fresno, owners; J. B. Summers, of Auberry, superintendent.

*Hercules Mine* (Quartz).—See our XIIth Report, p. 128. It is at Sampson Flat, at 2,700′ altitude. The tunnel has been extended some 30′, and the ground above stoped. S. C. Moore, of Dunlap, owner.

*Hidden Treasure Mine* (Quartz).—See Henrietta.

*Homestake Mine* (Placer).—See our XIIth Report, p. 129. It is at Sampson Flat, at 2,650′ elevation. A bed of gravel, 2′ to 8′ thick, on the second bench, is being sluiced. J. N. Albin, of Fresno, owner.

*Howell's Mine* (Hydraulic).—It is on Laurel Creek, 12 miles E. of Pine Ridge, at 5,450′ altitude. A 2′x2′ ditch, 3 miles long, conveys water from Laurel Creek, and delivers it, through 250′ of 7″ hose, to a 2″ nozzle, under 60′ pressure. The sluices are 24″ wide, and are supplied with Hungarian riffles. The bank of gravel is 8′ deep. Russell & Howell, of Pine Ridge, owners.

*Huron Mine* (Quartz).—See our XIth and XIIth Reports, pp. 215 and 128. It is in Auberry Valley, 1½ miles W. of Auberry, at 1,300′ altitude. The mine is abandoned and the mill and plant removed.

*Inyo Mine* (Quartz).—See our XIIth Report, p. 129. It is on Temperance Flat, 5 miles N.E. of Auberry, at 775′ elevation. Little work has been done in the mine since our last Report. At the end of the 400′ tunnel an upraise has been made to the next one above. The vein, 6″ to 3′ thick, consists of crushed quartz mixed with talc. The dip is 25° N.W., and the walls granite. A 1-stamp steam mill on the claim crushes about 1 ton per day, using a 60-mesh wire screen. No provision is made to save the 10% of sulphurets contained in the ore. J. S. Johnson, of Visalia, Tulare County, and Mrs. H. Sullivan, of Auberry, owners.

*Keno Mine* (Quartz).—See our XIIth Report, p. 129. It is on Temperance Flat, 5½ miles N.E. of Auberry, at 1,200′ altitude. Some prospecting is being done to find a new ore-shoot. Fresno Mining and Milling Co., owner; Harry Sherwood, of Fresno, superintendent.

*Kipp Mine* (Placer).—It is on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,750′ altitude. Water from Dinkey Creek is taken through a mile of 2′ ditch and 150′ of 4″ canvas hose to a 1½″ nozzle, under 70′ pressure. The sluices are 12″x12″, and paved with block riffles. The

bank has 3′ to 9′ of gravel, mixed with many large bowlders. W. J. Kipp, of Toll House, owner.

*Lemmon Mine* (Placer).—See our XIIth Report, p. 129. It lies on Stevenson Creek, 7 miles N.E. of Pine Ridge, at 5,700′ altitude, and contains 20 acres. Idle. D. M. Lemmon, of North Fork, Madera County, owner.

*Little Monitor Mine* (Quartz).—See our XIIth Report, p. 129. It is at Davis Flat, 2½ miles N.E. of Sampson Flat, at 2,900′ altitude. Idle. S. C. Moore, of Dunlap, owner.

*Lockwood Mine* (Placer).—It lies on Mill Creek, 2½ miles E. of Dunlap, at 2,200′ altitude, and contains 20 acres. J. M. Lockwood, of Dunlap, owner.

*M. A. B. Mine* (Quartz).—It is on Temperance Flat, 5 miles N.E. of Auberry, at 700′ altitude, and adjoins the Post Oak. The vein is 6″ thick, dips 60° E., between granite walls. Development consists of two tunnels, 70′ and 80′ long. R. L. Welch, of Auberry, owner.

*McDonald Mine* (Quartz).—See our XIIth Report, p. 129. It is on Big Creek, 5½ miles S.E. of Pine Ridge, at 4,460′ elevation. Idle. J. W. McDonald, of Fresno, owner.

*Mersaba Mine* (Placer).—See Ohio.

*Missouri Mine* (Placer).—It lies on San Joaquin River, at Pollasky, at 460′ altitude, and contains 20 acres. A bed of gravel, 10′ deep, lying in an old channel a few feet above high-water mark, is being sluiced out. J. T. Parker, of Pollasky, owner.

*Moore Mine* (Quartz).—It is on Hughes Creek, 15 miles E. of Sanger, at 1,800′ altitude. The vein contains 2′ of quartz, with few sulphurets. It strikes N. and S., and dips vertically between syenite walls. Idle. Vincent Moore, of Sanger, owner.

*Mount Stirling Mine* (Quartz).—See our XIIth Report, p. 130. It lies on Dog Creek, 5 miles S.E. of Letcher, at 1,560′ altitude. M. V. Ashbrook, of Letcher, owner.

*Ninety-Nine Mine* (Quartz).—See our XIIth Report, p. 130. It lies ½ mile N.W. of Dunlap, at 2,600′ elevation. J. W. Howell, of Dunlap, owner.

*Nob Hill Mine* (Quartz).—It is in Auberry Valley, 2½ miles N. of Auberry, at 1,460′ elevation. The vein occurs in granite, and contains 8″ of free milling-quartz, and dips 30° N.E. The mine is worked through a 450′ tunnel on the vein, and several winzes, 50′ deep, below it. An air shaft is being sunk to meet the end of the tunnel. A 5-stamp mill, using 650-lb. stamps and No. 9 slot screens, stands near the mouth of the tunnel. It is driven by a 16 H.P. engine, and has a capacity of 14 tons per day. Cavin & Hall, of Auberry, owners.

*Ohio (Mersaba) Mines* (Placer).—See our XIIth Report, p. 130. The property consists of several thousand feet of placer ground along the San Joaquin River, below the mouth of Fine Gold Creek. A dam was completed across the San Joaquin River, about 150′ above the mouth of Fine Gold Creek, in December, 1895, and the river turned into the canal cut for the purpose on the left bank. It was intended to employ pumps to raise water from the basin-like depressions on bedrock not drained naturally when the river was turned. These pumps were to be operated by a large undershot wheel placed across the canal. The wheel was so arranged that it could be raised or lowered to suit the flow of water passing through the canal. Ohio-Mersaba Mining Co., of Fresno, owner.

*Oro Fino, Nos. 1 and 2, Mines* (Quartz and Placer).—See our VIIIth and

XIIth Reports, pp. 207 and 130. They lie at Davis Flat, 2 miles N. of Sampson Flat, and are worked at present by ground-sluicing. A. P. Davis, of Traver, Tulare County, owner.

*Parker Mine* (Placer).—It is on San Joaquin River, at Pollasky, at 350′ altitude, and contains 20 acres. An old channel, with 10′ of gravel, is worked by ground-sluicing. W. H. Parker, of Pollasky, owner.

*Peck Mine* (Placer).—It lies on Dry Creek, 1½ miles below Toll House, at 1,650′ elevation. It is worked by ground-sluicing, water being obtained from a small gulch by a short ditch. John Peck, of Toll House, owner.

*Petrea Mine* (Quartz).—See our XIIth Report, p. 130. It is on Little Dry Creek, 4 miles S.W. of Toll House. A. W. Petrea, of Toll House, owner.

*Post Oak Mine* (Quartz).—It lies on Temperance Flat, 5 miles N.E. of Auberry, at 690′ elevation. The vein is 6″ wide, dips 60° E., in granite. It is developed by a tunnel 60′ long. R. L. Welch, of Auberry, owner.

*Protection Mine* (Quartz).—See our XIIth Report, p. 130. It is on Temperance Flat, 5 miles N.E. of Auberry, at 800′ altitude. Idle. J. Hoxey and W. A. Sheppard, of Fresno, owners.

*Providence Mine* (Quartz).—See our XIIth Report, p. 130. It is on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,000′ altitude. The vein occurs in granite, dips 50° N.E., and averages 2′ in width. The ore-shoot having been lost, a drift, 280′ long, has been run along the vein from the bottom of the 200′ shaft to prospect the claim. A 10-stamp water-power mill, using 750-lb. stamps, crushes the ore. Logan, Beard & Nelson, of Pine Ridge, lessees.

*Quien Sabe Mine* (Quartz).—See our XIIth Report, p. 130. It is 1½ miles W. of Temperance Flat, at 1,260′ altitude. The vein is 2′ wide, and dips 30° N.W., in granite walls. The rock contains 6% sulphurets. Development consists of three shafts, 40′, 40′, and 80′ deep, and a 600′ tunnel on the vein. Idle. D. H. Jackson, of Oakland, Alameda County, owner.

*Rabado Mine* (Placer).—It is on Bear Creek, 10 miles E. of Pine Ridge, at 8,000′ altitude. Worked by ground-sluicing. Luis Rabado, of Pine Ridge, owner.

*Rattlesnake Mine* (Quartz).—See our VIIIth Report, p. 215. It lies 1 mile W. of Temperance Flat, at 1,300′ elevation. Idle. D. H. Jackson, of Oakland, Alameda County, owner.

*Rip van Winkle Mine* (Quartz).—It is on Dog Creek, 3 miles S.E. of Letcher, at 1,560′ elevation. The vein averages 12″ thick, stands vertically, and strikes S.E. and N.W. It is worked through a 300′ tunnel, with a 50′ winze at its end. The country rock is granite. McCall Bros., of Letcher, owners.

*St. John Mine* (Quartz).—See Henrietta.

*Sawyer & Murray Mine* (Placer).—See our XIIth Report, p. 130. It lies on Mill Creek, 5 miles N.E. of Dunlap, at 2,640′ altitude. Worked by ground-sluicing. Sawyer & Murray, of Dunlap, owners.

*Slocum Mine* (Quartz).—See our XIIth Report, p. 130. It is on Big Pine Creek, 4½ miles E. of Pine Ridge, at 4,400′ altitude. The vein is 5″ to 2′ wide, and lies in granite, on a dip of 36° N.E. Development consists of three tunnels 40′, 50′, and 200′ long. Charles Slocum, of Reedley, owner.

*Smuggle Mine* (Quartz).—See Sunol.

*Sullenger Mine* (Quartz and Placer).—It lies on Dinkey Creek, 10

miles E. of Pine Ridge, at 5,750′ altitude. The 8″ vein dips 35° N.E., between granite walls. The ore is a soft, talcose, ocherous material. A tunnel, 150′ long, is driven on the vein, and the ore is treated in a water-power arrastra. Below the vein placer operations are carried on. A mile of 2′ ditch brings water from Dinkey Creek. There is 175′ of 4″ hose, with 1½″ nozzle, under 70′ pressure; 100′ of 12″x 12″ sluices with pole riffles. Richard Sullenger, of Pine Ridge, owner.

*Sunol* (*Smuggle*) *Mine* (Quartz).—See our XIIth Report, p. 130. It is on Temperance Flat, 5 miles N.E. of Auberry, at 700′ altitude. R. L. Welch, of Auberry, owner.

*Temperance Mine* (Quartz).—It is on Temperance Flat, 5 miles N.E. of Auberry, at 760′ altitude. It is an extension of the Inyo Mine. The vein is 12″ wide, dips 30° N.W., between granite walls, and consists of quartz, with few sulphurets. There are two tunnels, 100′ long, and a shaft 50′ deep on the vein. W. W. Alderman, of Auberry, owner.

*Thorn Mine* (Quartz).—See our XIIth Report, p. 131. It is on Keyes Creek, 3 miles S.E. of Letcher, at 1,320′ altitude. The vein occurs in granite, is 18″ thick, and dips 75° N.E. The development consists of three tunnels, 70′, 80′, and 200′ long, and a shaft 200′ deep. The ore is free-milling, containing few sulphurets. Idle. T. Waxford, of Sentinel, owner.

*Thornton Mine* (Hydraulic and Drift).—See our XIIth Report, p. 131. It is on San Joaquin River, 6 miles above Pollasky, at 550′ elevation, and contains 120 acres. A new plant is being erected to raise water, for hydraulicking, to the ditch 200′ above, by a centrifugal pump, driven by a breast wheel in the river. The ditch is 1′x 1′, and 800′ long. The pressure obtainable is about 110′, and an 8″ pipe and No. 1 giant will be used. The gravel lies in an old channel 70′ above the river, and is from 10′ to 25′ deep. A drift is being run to strike the bedrock in the lowest place. In April, 1896, it was 110′ long, and cut through slide material with many large bowlders. Jeff Donahue Mining Co., of Pollasky, owner.

*Thornton Mine* (Placer).—It is on Temperance Flat, 5 miles N.E. of Auberry, at 760′ altitude, and contains 20 acres. The material is 1′ to 4′ deep, and consists of float and debris from the Inyo Mine. Water for sluicing is obtained from the lower tunnel of the Keno Mine. D. M. Thornton, of Auberry, owner.

*Wakefield Mine* (Placer).—See our XIIth Report, p. 131. It is on Laurel Creek, 6 miles E. of Pine Ridge, at 5,450′ altitude. Water is taken from Laurel Creek through a short, small ditch. The plant consists of 200′ of 4″ canvas hose with 1½″ nozzle, under 60′ pressure, and 150′ of 12″x 12″ sluices, with block riffles. The gravel is from 3′ to 16′ deep. W. Wakefield, of Toll House, owner.

*Weatherby Mine* (Quartz).—See Crystal.

*Weimuth Mine* (Placer).—It is on Little Dry Creek, 4 miles S. of Letcher, at 1,600′ elevation. A 3′ bed of calcareous cement is being sluiced. A. Weimuth, of Letcher, owner.

*White Cross Mine* (Quartz).—See our XIIth Report, p. 131. It is at Dunlap, at 2,800′ altitude. Idle. Clark Moore et al., of Dunlap, owners.

*White Mule Mine* (Quartz).—It lies on Temperance Flat, 5 miles N.E. of Auberry, at 740′ elevation. The vein is 6″ thick, courses N. and S., and stands nearly vertically between walls of crumbly granite. There is a shaft 70′ deep, with short drifts both ways. R. H. Whittaker, of Auberry, owner.

## MILLS IN FRESNO COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Abbey | Steam | 10 | 800 | 25 | 4 | Frue | | | | |
| Confidence | Water | 5 | 600 | 5 | | | | | | |
| Hanover | Steam | 5 | 850 | 6½ | 1 | Frue | | | | |
| Henrietta | | 2 | 600 | 3 | | | | | | |
| Inyo | | 1 | 600 | 1 | | | | | | |
| Josephine | Steam | 20 | 900 | 50 | 8 | Frue | | | | |
| Keno | | 5 | 650 | | | | | | | |
| Last Chance | Steam | 10 | 900 | 11¼ | 2 | Frue | | | | |
| Nob Hill | | 5 | 650 | 14 | | | | | | |
| Providence | Steam | 10 | 610 | 12 | | | | | | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN FRESNO COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Plant, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| B. & M. | | | Arrastra | | 1¼ | | | | | | |
| Hancock | | | Rocker | | 2 | | | | | | |
| Sampson | Steam | | Kendall | | 8 | | | | | | |
| Sullenger | | | Arrastra | | 1 | | | | | | |

## Humboldt County.

This county adjoins Del Norte on the south. It extends about 150 miles along the seacoast, and is traversed by the mountains of the Coast Range. The principal industries are lumbering, dairying, and sheep-raising. The county ranks first in the State as a producer of redwood lumber and shingles; the redwood tree attaining a larger size here than elsewhere in the State. The product of butter shipped from Eureka to San Francisco during 1895 averaged 20,000 lbs. weekly. Hydraulic mining is prosecuted on the benches and bars of the Trinity and Klamath rivers, and beach mining at Gold Bluff and elsewhere along the coast. No quartz mine of importance has yet been developed in the county.

*Anderson Mine* (Hydraulic).—It embraces 160 acres on the Trinity River, opposite China Flat, at 400′ altitude above sea-level. Water is obtained from Bremer Gulch through a 3′x 2′ ditch, 2 miles long, and delivered through 400′ of 6″ pipe to a No. 1 giant, working under 80′ pressure. The bank is 15′ high, and all gravel. Idle. Harry Close, of Eureka, owner.

*Beach Mining.*—In many places along the coast auriferous black sands are found, and in Del Norte and Humboldt counties they have been worked with success. In the latter county, beach mining is being prosecuted between Klamath and Little rivers, and considerable gold is secured annually. The most important patch of pay-sand is found between Amany and Redwood creeks, 6 miles S. of Klamath River. It is 41½ miles long, and embraces five claims, as follows: *Johnston*, *Lower Gold Bluff*, or *Union*, *Ramona*, *Upper Gold Bluff*, or *Pioneer*, and *Swan*. Farther south pay-sand occurs at Stone Lagoon, Big Lagoon, and Little River. The bluffs between Amany and Butler creeks, a distance of 3 miles, consist of black carbonaceous metamorphic shale, containing calcite in blotches and streaks, and quartz in short veinlets. Here and there bunches and specks of pyrite are visible. Resting on the shale, which is about 500′ thick, is gravel, and it extends to the top of the mountain, some 2,000′ above sea-level. Immediately below Butler Creek the black shale disappears below the surface, and on it lies a bed of very crumbly gray sandstone, 150′ to 200′ thick, a vein of lignite, 6″ thick, and soft gray clay shale, 80′ thick. The whole dips 80° S. Nonconformably upon these beds lies the gravel, dipping 15° S. for a short distance, and then assuming a horizontal position. Near the bottom it is slightly cemented, while higher up it is not. The gravel bluffs stand nearly perpendicularly, and are from 100′ to 175′ high. Going south along the beach, 1½ miles, the bluffs gradually change. The gravel becomes finer, and the percentage of sand increases. Bands of soft gray sandstone appear, and grow thicker as we go south. Above the buildings of the Pioneer Mine a section shows from the bottom upwards, as follows:

| | |
|---|---|
| Gravel, slightly cemented | 10′ |
| Very soft blue sandstone | 15′ |
| Gravel, slightly cemented | 30′ |
| Very soft blue sandstone | 10′ |
| Small gravel and sand | 85′ |

The bluff maintains the same character 3½ miles down the coast, to a small lagoon, where the works of the Union Mine are located. Below

he lagoon, for ¾ mile, the bottom stratum of clay shale is visible, carrying here and there pieces of lignite and nodules of limonite. The bluffs are low, 10′ to 60′, and dip 20° S.W., or into the ocean. Immediately south of this the hills are broken away altogether, for a distance of 500′, by a small stream, and here a mass of serpentine crops out. From this point to Redwood Creek the hillside consists of serpentine and the same black metamorphic shale mentioned before. The gold found on the beach is derived, no doubt, from the gravel, and possibly also from quartz and pyrite in the black shale. As the breakers undermine the bluffs large masses break down and are disintegrated by the surf. The action of the waves during a strong wind differs at times, for no apparent reason. Sometimes after a storm the beach is narrow and steep, and at other times it is piled up with sand, several hundred feet wide. The ordinary surf, when the wind blows diagonally against the shore, has a panning action on the sand, taking away the lighter particles and leaving black sand and gold. Years ago the beach along the whole of the gold bluffs was narrow and steep, and the waves washed their base at every high tide. At present this is only the case at the south end. On the northern part, for a distance of 3 miles, sand has accumulated to a width of 200′ to 800′, and, besides, a broad sandbar is forming about a mile from shore. This deposit of sand has been noticed to grow for the last ten years. The material is no doubt brought down the Klamath River and carried south by the strong ocean current. The action is visible from the mountain tops, the yellow water from the Klamath and the blue of the sea being easily discernible. Mining the beach sand is done by collecting the black sand from the beach after the tide has gone out and washing it in ordinary and patent "toms," constructed as described hereafter.

*Big Lagoon Mine* (Beach).—See our XIth Report, p. 230. It is 9 miles N. of Trinidad, and embraces 20 acres. Big Lagoon is a bay, 40′ deep, 4 square miles in area, and separated from the ocean by a sand dune 300′ to 600′ wide. At high tide, during storms, the breakers pass over the dune into the lagoon. Generally in winter an outlet near the south end is open, and the tide passes in and out, but in the summer this closes. The low hills near the ocean, north and south of the lagoon, consist of gravel and coarse sand, with oyster shells; evidently a recent marine deposit. Back, or east, of the lagoon the hills are 1,000′ to 1,200′ high, and here a bed of hard greenish conglomerate crops out. Farther south metamorphic black slates and gray sandstones were noticed, but their relative position could not be determined. Gold is found in the bottom of the lagoon and in the sand dune, and many ingenious contrivances have been constructed to save it, but it seems so far without success: the gold is too fine. Near the south end an ordinary "tom," with plates, is in position. Water is obtained from a small gulch ½ mile away. The sand is scraped into the sluice with little labor. Idle. Chas. F. Bradford, of Trinidad, owner.

*China Flat Mine* (Hydraulic).—It lies on Trinity River, 2½ miles above China Flat, and embraces 80 acres, at 560′ altitude. Water is taken from China Creek through a 3′x 2′ ditch, 2 miles long, and delivered through 200′ of 6″ pipe to a No. 1 giant, under 80′ pressure. A small reservoir is used when water becomes scarce. Alfred Foote, of China Flat, owner.

*Clover Gulch (Bistel) Mine* (Hydraulic).—See our XIIth Report, p. 132. It consists of 160 acres on Trinity River, 1 mile below China Flat, at 370′ altitude. Idle. Frank Bussel, of China Flat, owner.

*Crooks Crest Mine* (Hydraulic).—It lies on Klamath River, at mouth of Red Cap Creek, and contains 60 acres, at 520′ altitude. The bank is 30′ high, and all gravel. The construction of a ditch, 6′x 2′ and 3½ miles long, from Red Cap Creek has been commenced. Thos. T. Tighe, of Trinidad, owner.

*Croton Bar Mine* (Hydraulic).—Fully described in our XIIth Report, p. 132. It embraces 20 acres and lies on Klamath River, 1½ miles above Orleans Bar, at 770′ altitude. About 1 acre was washed in season of 1895. E. Markerson, of Orleans, owner.

*Dungan Mine* (Hydraulic).—It lies on Trinity River, 6 miles above China Flat, and contains 160 acres, at 540′ altitude. Water is derived from Campbell Creek by a 3′x 4′ ditch, 2 miles long, and delivered through 300′ of 10″ pipe to a No. 2 giant. The sluices are 24″ wide. The bank is 35′ high, and all gravel. Thos. Dungan, of China Flat, owner.

*Ferris Mine* (Hydraulic).—See our XIIth Report, p. 132. It lies on Klamath River, 1 mile below Orleans, and contains 30 acres, at 700′ altitude. A. Ferris, of Orleans Bar, owner.

*Johnston's Mine* (Beach).—See our XIth Report, p. 232. It extends for half a mile along the coast, 7 miles S. of the Klamath River, and contains 60 acres. Idle. A. D. Johnston, of Orick, owner.

*Little River Mine* (Beach).—It lies at the mouth of Little River, 10 miles N. of Arcata, and contains 111 acres. South of the river, for 2½ miles, the ocean has thrown up a vast amount of fine white sand, which forms a high dune along the coast. Inside of the dune is a narrow strip of low land, and here the black sand is found in a solid stratum, 8′ thick, lying on the bedrock, and covered by 12′ of gray sand. Back of the mine are high bluffs of gravel—recent marine deposits. The black sand, mixed with water, is hoisted by an 8′x 2″ Chinese pump to the top of a frame, whence it drops on the tom. Several machines for saving the gold have been tried and abandoned. The company is now building an "Oregon machine"—see Union Mine. The sluice-boards are 36′ long, and set on a grade of 1¼″ to 1½″ per foot. The sand is rich in gold, and more so in platinum. The gold is fine, and hard to save. The platinum is coarser, and can be seen with the naked eye. A 16 H.P. engine furnishes the power for the pump and sand-pump. H. Close et al., of Eureka, owners.

*Lupton Mine* (Placer).—It lies on Willow Creek, a tributary of the Trinity, 5 miles W. of China Flat, and contains 20 acres, at 960′ altitude. Worked by ground-sluicing. Platte Lupton, of China Flat, owner.

*Mettah Mine* (Placer).—See our XIIth Report, p. 133. It lies on the Klamath bluff, and contains 20 acres. Altitude, 160′. It is worked by individual Chinamen, with rockers.

*Moore Mine* (Placer).—It is on Willow Creek, 4 miles W. of China Flat, and contains 20 acres, at 710′ altitude. Worked by wingdam and ground-sluicing in the creek bed. William Moore, of China Flat, owner.

*Mowrick Mine* (Hydraulic).—See our XIth Report, p. 230. This lies on the Klamath, 9 miles above Klamath, and contains 450 acres. Altitude, 2,000′. Water is taken from Capell Creek, through a ditch 4½

Oregon Tom, Union Mine.

Ordinary Toms, with Plates, Union Mine.

iles long, and passed through 600′ of 11″ pipe. Two benches have en explored, 1,500′ and 2,300′ above the river. Idle. Mowrick Hill ining Co., owner; A. B. Campbell, of San José, Santa Clara County, perintendent.

*Napier Mine* (Placer).—See our XIIth Report, p. 133. It lies on he Klamath, half a mile below Klamath, and contains 20 acres, at 180′ ltitude. Worked by ground-sluicing. F. Sebastion, of Klamath, wner.

*Orleans Bar Mine* (Hydraulic).—Fully described in our XIIth eport, p. 133. It lies at Orleans, on the Klamath River, and contains ,500 acres, at 675′ altitude. About half an acre was worked in season f 1895. Orleans Bar Placer Mining Co., owner; P. L. Young, of rleans Bar, superintendent.

*Ossagan Mine* (Hydraulic).—It lies on Ossagan Creek, 9 miles S. of he mouth of the Klamath River. Water is obtained from Prairie reek, through a tunnel 1,000′ long. Idle for years. F. Adams, of Oakand, owner.

*Pearch Mine* (Hydraulic).—Fully described in our XIIth Report, p. 34. It lies 1 mile above Orleans, on the Klamath River, and contains 0 acres, at 690′ altitude. About half an acre was cleaned up during eason of 1895. J. A. Pearch, of Orleans Bar, owner.

*Pioneer* (*Upper Gold Bluff*) *Mine* (Beach).—See our XIIth Report, . 134. It is 12 miles from Klamath River, and contains 1,500 acres. t extends along the ocean 4 miles. It was worked by collecting sand n the beach and washing it in "toms," but has been idle since 1889. dson T. Adams, of Oakland, owner; Chas. Savage, of Orick, manager.

*Ramona Mine* (Beach).—It lies 6 miles S. of the Klamath River, and ontains 20 acres. The auriferous sands are collected, and washed in oms. Idle since 1894. Thos. Tighe, of Trinidad, owner.

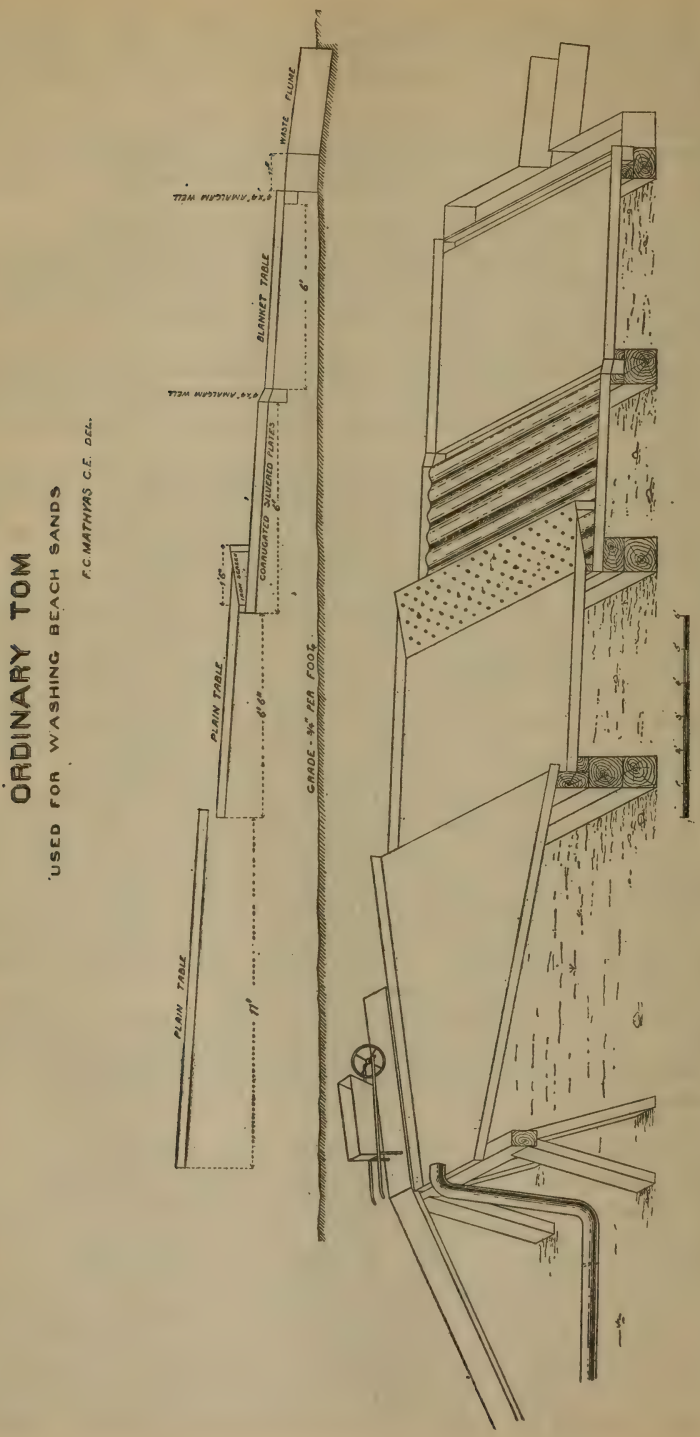
*Red Cap Mine* (Hydraulic).—Described in our XIIth Report, p. 134. t lies on the Klamath River, 10 miles below Orleans Bar, and contains 0 acres, at 520′ altitude. About half an acre has been washed—cleaned p during the season of 1895. William Lord, of Orleans Bar, owner.

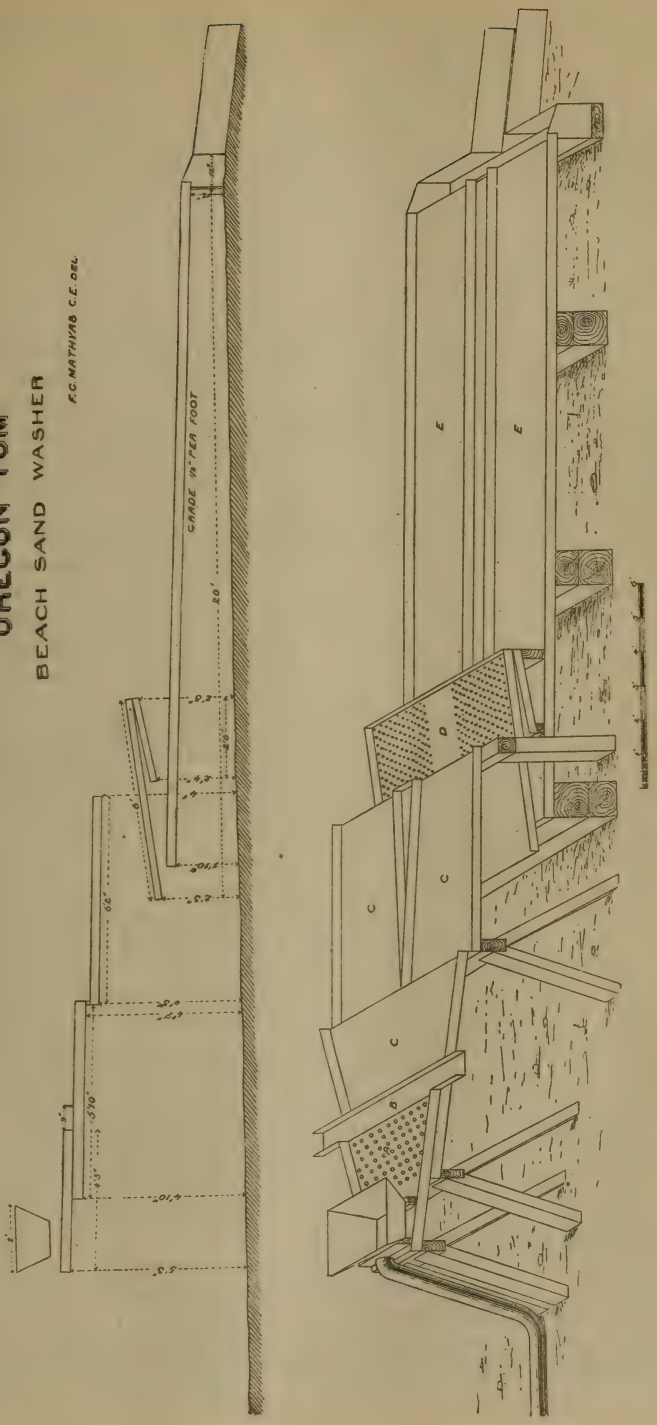
*Salstrom's Mine* (Hydraulic).—Described in our XIIth Report, p. 134. It contains 80 acres, at 670′ altitude, and lies 1½ miles below Orleans Bar, on the Klamath River. A rich pocket was found in this claim in 1895. Jonas Salstrom, of Orleans Bar, owner.

*Stone Lagoon Mine* (Beach).—It is at Stone Lagoon, 16 miles N. of Trinidad. Nearly every spring attempts are made to extract the gold from the beach sands at this place, but all of them have proven failures, on account of the fineness of the gold. At present the property is deserted.

*Swan's Mine* (Beach).—See our XIth Report, p. 232. It lies N. of Redwood Creek, and contains 160 acres, having a frontage of 2 miles on the coast. It is worked by packing the sand from the beach on mules and washing in an ordinary "tom," with plates. One hundred and fifty tons were treated in 1895. R. Swan, of Orick, owner.

*Union* (*Lower Gold Bluff*) *Mine* (Beach).—It lies 16 miles S. of the Klamath River, and contains 1,900 acres, extending 4 miles along the ocean. The black sand is collected on the beach, and washed in "toms." If, after the tide has started to go down, black sand is noticed on the beach, men are at once set to work with square-toed shovels, sacking it. It is then packed on mules to the washing-machine, or temporarily


ORDINARY TOM
USED FOR WASHING BEACH SANDS
F.C. MATHIAS C.E. DEL.
WASTE FLUME
BLANKET TABLE
CORRUGATED RIFFLED TAPES
PLAIN TABLE
PLAIN TABLE
GRADE - 3/4" PER FOOT


OREGON TOM
BEACH SAND WASHER
F.G. MATHIAS C.E. DEL.
GRADE 14" PER FOOT
20'
E
E
D
C
C
C
D

stacked above the reach of high-water surf. A small lagoon on th claim is separated from the ocean by a sand dune, 500′ to 800′ wide ar 15′ high. This dune contains gold in paying quantities, and quite plant is established to extract it. A 16 H.P. engine is used to pum water for the toms and to hoist the sand to the hoppers. Two kinc of machines are used. There are three of the ordinary "tom" patter with amalgamated plates. The sand is dumped from a barrow on th "spreader," which is 11′ long, 2′ wide at the upper and 6′ wide at th lower end. It then drops 3″ to the "plane" table, 6′ wide and 6′ 6 long, terminating with a sheet-iron screen with ¼″ perforations, and s on the reversed grade, where the gravel, drift wood, etc., are retaine and removed frequently by an attendant. The clean sand then pass over a table, 6′ wide, 6′ long, and covered with corrugated silvere plates; thence to the "blanket" table, 6′ wide, 6′ long, and covered wit a coarse blanket. These tables terminate with a mercury "trap," c well, 4″ wide, 4″ deep, and 6′ long, where fine gold, amalgam, an quicksilver are caught. The sands then pass to the waste flume. Abou 50 inches of water and three men are required to operate this machin which loses some fine gold, but which might be remedied to a gre extent by substituting tapestry or Brussels carpet for the blanket, as it use in the quartz mills of the central gold belt has given unqualifie satisfaction in saving *very fine* gold. The other pattern is a recer invention, called the "Oregon machine," and also requires no powe It handles about 200 tons of sand in twenty-four hours, and is cor sidered a success by the operators. It saves more of the fine gold tha any machine yet tried. The sand is shoveled into cars, holding nearly ton, and hoisted from the pit up an incline to the platform, an dumped from the car into a hopper; thence it falls on a grizzly, o screen *A*, where water causes the sand to separate from the larger grave which is removed by a square shovel into a waste chute, *B*. The sifte sand falls on table *C C C*, which gradually widens to 5′, where ther is a drop of 4″, and the lower part of the table is divided in two part each 2′ wide, by a central rib. At lower end of table *C C*, the materia drops 8″ on an iron plate, *D*, set on a reversed grade, and perforate with ¼″ holes. The fine sand passes through the perforations to tw "gold-savers," *E E*, while the coarse sand is raked to one side. Thes gold-savers are each 25′ long, 2′ wide, and with 4″ sides. The botto is made of a single 2″ plank, roughened with scratches like those mad by a badly set circular saw, and dressed every few days with a *flui which is said to attract the gold;* its composition is kept secret. It i said that a trial without the dressing resulted in some of the finer gol being lost. A "Gold King amalgamator" was tried here, but discarde because it required power, and also that the plates "scoured." The gol saved is mixed with about 5% coarse platinum. Twenty men ar employed and twenty mules are used to pack black sand whenever ther is any. Union Gold Bluff Mining Co., owner; Chas. F. Kapp, of Sa Francisco, superintendent.

*Uscellina Mine* (Hydraulic).—Described in our XIIth Report, p. 135 Altitude, 850′. L. Nelson, of Orleans Bar, owner.

*Walther's Mine* (Beach).—It is at Trinidad, and contains 20 acres All of the auriferous sand (black and gray) is run through the "tom," which consists of a sluice-box, 14″ wide, with a screen, perforated wit

' holes, at the lower end to separate the material. The plates are ranged in a series of 12 steps, 14″x 8″, covered by a silvered plate.

*White's Mine* (Placer).—It lies on Willow Creek, 7 miles W. of China lat, and contains 20 acres, at 1,150′ altitude. Dincen White, of China lat, owner.

*Weitchpec Mine* (Hydraulic).—Described in our XIIth Report, p. 135. lies at Weitchpec, on the Klamath River, at an altitude of 550′, and ntains 25 acres. About ¼ acre was cleaned up in season of 1895. 'illiam Lord, of Orleans Bar, owner.

## Inyo County.

*Abe Lincoln Mine* (Quartz).—See Luella.

*Alvord Mine* (Quartz).—It is on the western slope of the White lountains, 6 miles E. of Big Pine, at 4,700′ elevation. The vein is 6″ 3′ wide, courses N. and S., and dips 80° E., between slate and granite. t is prospected by a 75′ cross-cut tunnel, which taps the vein at 50′, here a 10′ winze has been sunk. The ore is free-milling, and is reduced n an arrastra on Burch Creek. M. A. Bush, of Alvord, owner.

*American Flag Mine* (Quartz).—See our XIIth Report, p. 135. Estate f Victor Trapier, of Lone Pine, owner.

*Argus Gold Mining Co.'s Mines* (Quartz).—See our XIIth Report, pp. 36 and 140. They lie in Snow's Cañon, 4 miles S. of Modoc, at 5,000′ ltitude, and embrace nine claims. The *Last Chance* and *St. Paul* are he principal ones. There are four long tunnels, besides many shorter nes on different veins. The main vein is 2′ to 4′ wide, and dips verti- ally between granite walls. A new shaft is being sunk to furnish air or the lowest long tunnel. A 5-stamp steam-power mill, using 750-lb. tamps, has been built, and is about ready to start. Argus Gold Mining Co., owner; E. C. Garlick, of Darwin, superintendent.

*Baldy Mine* (Quartz).—It is in Snow's Cañon, 3 miles S. of Modoc, at ,460′ altitude, and embraces three claims, developed by four shafts, 10′ o 30′ deep. The vein occurs in granite, dips 85° S., and is 24″ to 30′ wide. Louis de Tournel, of Darwin, owner.

*Barranca Mine* (Quartz).—See our XIIth Report, p. 136. It lies in Hunter's Cañon, 16 miles E. of Lone Pine, at 7,000′ elevation, and embraces, among others, the *Briton & Porter* and *Barranca* mines, all being on the same vein. In the Barranca ground there is a 325′ tunnel along the vein; in the Briton & Porter ground an incline, 218′ deep, has been sunk, with a 110′ drift on the 100′ level, and one 60′ long on the 200′ level. The country rock is granite. The vein averages 6′ wide, and consists of a crushed mass of granite and quartz dipping 20° N. Five tons of ore is ground daily in three arrastras driven by a 12 H.P. engine. Hunter & Spears, of Lone Pine, owners.

*Benicia Mine* (Quartz).—It is in Robles Cañon, 16 miles E. of Lone Pine. A 3½′ vertical vein is developed by a tunnel 350′ long and a shaft 80′ deep. John Black et al., of Bishop, owners.

*Black Warrior Mine* (Quartz).—See Red Chief.

*Blue Bell Mine* (Quartz).—It is in Snow's Cañon, 14 miles S.E. of Darwin, at 5,000′ elevation. There is a 212′ tunnel on the vein, and a 30′ upraise with some stopes. The vein is 2″ to 6″ thick, dipping 45° S.W., and runs from the granite into limestone; in the former the quartz

is rich, while in the latter it is almost barren. J. J. Morton, of Keeler, owner.

*Bonanza Mine* (Quartz).—See our XIIth Report, p. 136. It is in Mountain Spring Cañon, 25 miles S. of Darwin. The shaft has been deepened to 250′, and another drift started. The horse-power arrastra crushes 1 ton per day. John Andrada, of Freeman, owner.

*Brown Monster* (*Eclipse*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 263 and 136. It is on the western base of the Inyo range, 10 miles S.E. of Independence. Idle. A. W. Eibeschutz, of Independence, owner.

*Carrie Crouse Mine* (Quartz).—It is on Jackknife Hill, 12 miles S.W. of Big Pine, at 5,500′ elevation. The vein, 2″ to 12″ wide, courses N. and S., and dips nearly vertically. A 150′ tunnel on the vein gives 75′ of backs. A 45′ shaft has been sunk on the vein in the south end. The ore is reduced in an arrastra, 2 miles distant. S. W. Jones, of Big Pine, owner.

*Casey Mine* (Quartz).—It is 5 miles N. of Laws. The vein is 8″ to 3′ wide, and dips 30° N.E. between slate walls. There is a tunnel 300′ long, with a 400′ winze at its end. Hoisting is done by a horse-whim outside of the tunnel, the rope running between the car tracks. A 5-stamp mill, using 1,000-lb. stamps, belongs to the property. It is driven by a 3′ Pelton wheel under 185′ pressure. About 14 tons are crushed per day. Inyo Gold Mining Co., owner; O. E. Duenwig, of Laws, superintendent.

*Chilulu, Gavilan, Montano, and San Antonio Mines* (Quartz).—See our XIIth Report, p. 137. This group lies near the head of Robles Cañon, on the eastern slope of the Inyo range, 16 miles E. of Lone Pine. Idle. Charles Green et al., of Lone Pine, owners.

*Copper King and Copper Queen Mines* (Quartz).—They lie on Little Pine Creek, 8 miles S.W. of Big Pine, at 6,200′ altitude, and are located on an 8″ to 12″ vein of auriferous quartz carrying a large percentage of chalcopyrite. Developed by a 40′ shaft. F. D. Pratt, of Big Pine, owner.

*December Mine* (Quartz).—It is in the foothills, 2 miles N.W. of Lone Pine, at 4,060′ altitude. It embraces three claims along a vein 6″ to 2′ wide. The immediate walls are porphyry; the country rock syenite. The quartz contains iron and copper pyrite, and occasionally a cluster of galena. It is treated in a water-power arrastra ½ mile distant. There is a 100′ tunnel and 135′ of drifts. Ore is being extracted at present from the surface only, where the vein, which below dips 40° S.W., lies quite flat, and is covered merely by a few feet of stratified tufa. R. C. Spear, of Lone Pine, owner.

*Dido Mine* (Quartz).—See Georgia.

*Dodd Mine* (Quartz).—It is in Lee District, 20 miles N. of Darwin. David Pabst, of Lone Pine, owner.

*Free Coinage Mine* (Quartz).—It is in Snow's Cañon, 5 miles S. of Modoc, at 5,000′ altitude. An 8″ vein is being mined in two tunnels, 20′ and 80′ long, and it dips vertically between granite walls. Paul Pfefferle, of Modoc, owner.

*Garfield Mine* (Quartz).—See our XIIth Report, p. 137. It is in Fish Springs District. No new developments. Jerry Moier, of Independence, owner.

Arrastra of the Georgia Mine.

*Georgia Mine* (Quartz).—See our XIIth Report, p. 137. It is in Redding Cañon, 9 miles E. of Bishop, at about 7,000′ elevation, and includes the *Dido* and *Twilight* claims. The vein is bunchy in character, running from 1″ to 2′ in width and dipping 50° N. between walls of granite. Developments consist of a tunnel 345′ long, having an inclined winze 170′ deep, at a point 150′ from its mouth. The rich quartz is treated in a 10′ arrastra, driven by 12 miner's inches of water on an 18″ Dodd wheel, under 90′ pressure, received through 450′ of 4″ pipe. The drags (mullers) weigh from 300 to 800 lbs. and make about eight revolutions per minute. George F. Willis, of Independence, owner.

*Gold Bug Mine* (Quartz).—See our XIIth Report, p. 137. It is on Fish Springs Hill, 20 miles N. of Independence.

*Gold Dollar Mine* (Placer).—It is 7 miles N.E. of Independence, and comprises 20 acres of gravel from 4″ to 1′ deep. Worked with a dry-washer. George Thorpe, of Independence, owner.

*Golden Reef* (*Hardscrabble*) *Mine* (Quartz).—See our XIIth Report, p. 137. It is in Fish Springs District. Idle. James McCarty, of Tinemaha, owner.

*Gold Gulch Mine* (Quartz).—See our XIIth Report, p. 137. It lies in Gold Gulch, on the western slope of the Panamint range. Idle. R. W. McIntyre et al., of Redlands, San Bernardino County, owners.

*Good Luck Mine* (Quartz).—It is on Little Pine Creek, 8 miles S.W. of Big Pine, at 6,300′ elevation. A tunnel 106′ long develops a 3′ vein of quartz dipping 65° N.W. The ore shows some sulphurets. F. D. Pratt, of Big Pine, owner.

*Goodwin Mine* (Quartz).—It is in Snow's Cañon, 3 miles S. of Modoc, at 4,750′ altitude. A 6″ vein of rich quartz is exposed in a partly stoped 50′ tunnel, and dips 85° S. between granite walls. Louis de Tournel, of Darwin, owner.

*Hardscrabble Mine* (Quartz).—See Golden Reef.

*Hirsch Mine* (Quartz).—See our XIIth Report, p. 138. It is on the western slope of the Inyo Mountains, 10 miles S.E. of Independence, at 4,500′ elevation. The vein dips 35° N.E. in limestone, and varies from 3′ to 8′ in width. The quartz ore contains galena, in sometimes large bunches, besides iron and copper pyrites. The mine is developed by a tunnel 300′ long, at the end of which underhand stoping is carried on to a depth of about 50′. A tramway ½ mile long conveys the ore to a 10-stamp mill, which is driven by a 22″ Leffel turbine wheel under a 28′ head. The stamps weigh 1,000 lbs., and the sulphurets are saved by two Frue vanners. Reward Mining Co., owner; George T. Reeves, of Frances P. O., superintendent.

*Hope and Arrastra Mines* (Quartz).—See our XIIth Report, p. 138. They lie in the Inyo range, 15 miles N. of Independence. Nathan Rhine, of Independence, owner.

*Josephine Mine* (Quartz).—See our XIIth Report, p. 138. It is 8 miles S.W. of Darwin. Idle. J. Wilson, of Lone Pine, owner.

*Keynote Mines* (Quartz).—See our XIIth Report, p. 138. They comprise the *Beauty*, *El Paso*, *King*, *Lone Pine*, *Mexican*, and *Queen*, and lie on the eastern slope of the Inyo range, at 8,000′ elevation. Some stoping is being done in the lowest tunnel. A 5-stamp steam-power mill, with 750-lb. stamps, belongs to the property. J. Laskey, of San Francisco, owner.

*Keys' Mine* (Quartz).—See our XIIth Report, p. 138. It is in Beveridge District, 20 miles E. of Independence, at 8,000′ altitude. Quartz

is being stoped from the drifts as fast as they can be extended, and i milled in a steam-power arrastra, 8 miles S. of the mine. The vein i in granite, and averages 14″ in width. Pat Keys, of Independenc owner.

*Lakeview Mine* (Placer).—It is 7 miles N. of Independence, an comprises 20 acres. The gravel, 4″ to 1′ deep, is worked in a dry-washe J. W. Wright, of Independence, owner.

*Last Chance Mine* (Quartz).—See Argus Gold Mining Co.

*Laura and McAvoy Mines* (Quartz).—See our XIIth Report, p. 13 Idle, as also is the 5-stamp mill. A. F. Mairs, of Independence, owne

*Luella* (*Abe Lincoln*) *Mine* (Quartz).—See our XIIth Report, p. 13 It is in Alabama District, 6 miles N.W. of Lone Pine, at 4,450′ altitud and is located on a vertical vein, 3″ to 6″ thick, occurring in granit The rich, free-milling quartz is treated in a water-power arrastra. Joh Basto, of Independence, owner.

*McAvery Mine* (Quartz).—It is in Snow's Cañon, 4 miles S. of Modo at 5,050′ elevation. The vein consists of 4′ of talcose matter carryin gold, and dips 85° N. between granite walls. It is developed by a 15 tunnel on the vein. George McAvery, of Modoc, owner.

*Magnet Mine* (Quartz).—See Tombstone.

*Mariposa Mine* (Quartz).—See our XIIth Report, p. 139. It is patented claim a little N. of Coso. Idle. J. B. Haggin, of New Yor owner.

*May Mine* (Quartz).—It is in Fish Springs District, 3 miles S. of Tine maha. An 8″ vein is developed by a 70′ shaft and 50′ of drifts. Th quartz contains about 8% of rich sulphurets, and is crushed in a wate power arrastra. C. F. Fuller, of Tinemaha, owner.

*Mazourka Cañon Placer Mines.*—See our XIIth Report, p. 139. The are on the western slope of the Inyo Mountains, 7 miles E. of Inde pendence. The gold is found in from 6″ to 4′ of drift, lying in the sma tributaries of Mazourka Cañon. It is all coarse; nuggets weighing fro $1 to $10 are frequently picked up, some being still attached to quart The pay-dirt is run through dry-washers, yielding, it is said, $4 per ma per day. The following parties own claims in the cañon:

| | Machines. | Men at Work. |
|---|---|---|
| Race Carasco | 3 | 7 |
| Cerro Gordo | 1 | 2 |
| Elario Arambula | 1 | 2 |
| A. McMullin | 1 | 2 |
| J. Ramsey | 1 | 2 |
| McCormick Bros. | 1 | 2 |
| Jos. Glass | 3 | 6 |

Several small quartz veins were noticed in the cliffs above the gol find, but proved to be barren.

*Mountain Chief Mine* (Quartz).—It is on Cottonwood Creek, 25 mile E. of Bishop. A 60′ shaft with a 70′ drift has been made on a 2′ free milling quartz vein. J. D. Jones, of Bishop, owner.

*North Star Mine* (Quartz).—It is in Alabama District, 6 miles N.W of Lone Pine, at 4,450′ elevation. The vein is 3″ to 12″ thick, and dip 85° W. in granite. The ore is a mass of auriferous sulphurets. Devel oped by an 80′ shaft. Julius Schroeder, of Independence, owner.

*North Star Mines* (Quartz).—This group lies in Snow's Cañon, 2 miles S. of Modoc, at 5,100′ elevation, and embraces four claims recentl

cated. So far four veins, from 12″ to 36″ wide, have been found in the roperty. Only surface work is done. Paul Pfefferle, of Modoc, owner.

*Polita Mine* (Quartz).—See our XIIth Report, p. 139. It is in Redding añon, 9 miles E. of Bishop, at 5,500′ altitude. The winze has been xtended to a depth of 175′, and drifts run 50′ E. and 60′ W. The vein verages 24″, and dips 40° N. The arrastra is driven by an 18″ Dodd heel under 165′ pressure. George Storey, of Bishop, owner.

*Post Office Springs Mine* (Quartz).—See our XIIth Report, p. 139. It on the Panamint range, 2 miles E. of Post Office Springs, at 5,000′ evation. A 5-stamp mill, using 750-lb. stamps, and a concentrator, ave been erected. Very little development work is done. The ore in ght was taken out and milled. Charles Anthony, of Darwin, owner.

*Queen Mine* (Quartz).—See our XIIth Report, p. 140. It is 20 miles . of Independence. Thomas Hill, of Big Pine, owner.

*Red Chief* (*Black Warrior*) *Mine* (Quartz).—It is on Big Pine Creek, miles W. of Big Pine, at 6,477′ elevation. A 40′ cross-cut tunnel cuts ie 2′ vein, and gives 60′ of backs. A winze sunk on the vein at this lace is 100′ deep, and a 225′ tunnel, running west on the vein, exposes fine body of ore, which is treated in a water-power arrastra close by. aniel M. Trestle, of Bakersfield, Kern County, owner.

*Rio Vista Mine* (Quartz).—See our XIIth Report, p. 140. It is in Fish prings District. Idle. J. McCarthy, of Big Pine, owner.

*Rose Mine* (Quartz).—It is in Fish Springs District, 2 miles W. of inemaha, and is developed by a 200′ tunnel, partly stoped. The vein es in granite on a dip of 80° W., and shows from 6″ to 18″ quartz with w sulphurets. Ed. Rose, of Tinemaha, owner.

*Sanger Co.'s Mines* (Quartz).—See our XIIth Report, p. 140. The wenty-three claims lie 20 miles S. of Darwin, in the Argus range. No ecent developments. A 5-stamp mill is to be erected. Mills & Stiles, f Freeman, owners.

*Santa Cruz Mine* (Quartz).—It is in Robles Cañon, 16 miles E. of one Pine. The vein is bunchy, varying from a mere seam to 5′ in idth. It is developed by two tunnels, 60′ and 300′ long, which are onnected by a 100′ winze. John Black, of Bishop, owner.

*Sharp Mine* (Quartz).—It is in Alabama District, 6 miles N.W. of one Pine. The vein occurs in granite, is 6″ wide, and dips 30° E. A 50′ tunnel on the vein is being stoped. James Sharp, of Independence, wner.

*Slate Range* is the most southerly spur of the Argus Mountains, and ies from 40 to 60 miles S. of Darwin. Considerable prospecting for old is going on, and some 30 men are said to be at work. The country eems to be promising, but so far no great strikes have been made.

*St. Elmo Mine* (Quartz).—It is in Robles Cañon, 16 miles E. of Lone ine. There are two inclines, 150′ apart, 35′ and 50′ deep, respectively, nd connected by a drift. The vein is 4′ wide, and dips 40° N. John lack et al., of Bishop, owners.

*St. Paul Mine* (Quartz).—See Argus Gold Mining Co.

*Stone Cabin Mine* (Quartz).—It is in Snow's Cañon, 2½ miles S. of Modoc, at 5,150′ elevation. A 6″ vein of free-milling quartz, dipping ertically between granite walls, is exposed in three shafts, 10′ deep. Paul Pfefferle, of Modoc, owner.

*Tip Top Mine* (Quartz).—See our XIIth Report, p. 140. It is 8 miles S. of Big Pine, in Fish Springs District, at about 5,000′ elevation. The

6″ to 15′ vein courses E. and W., and dips slightly to the nort Developed by two tunnels, 250′ and 400′ long, giving 300′ of back The rock is worked in a 12′ arrastra in Burch Creek, 1 mile S. of th claim. It is run by a 12′ overshot waterwheel. N. Tracy, of Big Pin owner.

*Tombstone* (*Magnet*) *Mine* (Quartz).—See our XIIth Report, p. 13 It is in Fish Spring District, 12 miles S. of Big Pine, at 5,400′ elevatio The 2′ to 5′ vein courses E. and W., dipping nearly vertically betwee a granite foot-wall and diorite hanging-wall. The quartz contains abo 6% of rich sulphurets. Developed by two tunnels and several winze The main tunnel is 700′ long, and has passed through three shoots ore, each about 60′ long. Two winzes from this tunnel are 50′ deep, ar show a 3′ vein in the bottom. The ore is worked in an arrastra on Burc Creek, 1 mile distant. G. B. Cometti, of Big Pine, owner.

*Waterman's Mill.*—It is at Coso, 8 miles S.W. of Darwin, and ha 5 stamps of 850 lbs. each. Power is furnished by a 12 H.P. engin Wood costs $10 per cord. Mills custom ores exclusively. W. M. Wate man, of Darwin, owner.

*Yellow Jacket Mining Co's. Mines* (Quartz).—See our XIIth Repor p. 141. Its four claims lie in the White Mountains, 12 miles E. of Bisho Creek. Idle.

MILLS IN INYO COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs in Tons. |
|---|---|---|---|---|
| Argus | Gas | 5 | 750 | 5 |
| Casey | Water | 5 | 1,000 | 14 |
| Golden West | Steam | 5 | 700 | 10 |
| Hirsch † | Water | 10 | 1,000 | |
| Ibex | Steam | 5 | 600 | 5 |
| Kearsarge | Water | 10 | 650 | 15 |
| Keynote | Steam | 5 | 750 | 10 |
| Laura | Steam | 5 | 600 | 5 |
| Los Angeles | Steam | 10 | 850 | 20 |
| Maxim | Steam | 5 | 950 | 8 |
| McEvoy* | Steam | 5 | 900 | 10 |
| Old Coso | Steam | 5 | 700 | 10 |
| Owens Lake | Steam | 10 | 850 | 15 |
| Post Office Spring | Steam | 5 | 750 | |
| Redlands | Steam | 5 | 800 | 8 |
| Reward | Water | 10 | 900 | 20 |
| Rex Mortis | Water | 5 | 750 | 10 |
| Sanger | | 5 | | |
| Surprise | Steam | 10 | 950 | 20 |
| Waterman | Steam | 5 | 850 | |
| Wilson and Wibbelt | Steam | 2 | 800 | 5 |

† Has 2 Frue concentrators.

In addition to stamps, the mills marked with a * have additional crushing capaci as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN INYO COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons |
|---|---|---|---|---|---|
| vord | Water | 1 | Arrastra | | |
| rranca | Steam | 3 | Arrastra | | |
| nanza | Horse | 1 | Arrastra | | 1 |
| rrie Crouse | | 1 | Arrastra | | |
| nfidence | Gas | | Roller | | 25 |
| cember | Water | 1 | Arrastra | | |
| rfield | Water | 1 | Arrastra | | 1 |
| orgia | Water | 1 | Arrastra | | 2½ |
| ld Dollar | | 1 | Dry-Washer | | |
| ys | Steam | 1 | Arrastra | | |
| keview | | 1 | Dry-Washer | | |
| ella | Water | 1 | Arrastra | | 1 |
| agnet | Water | 1 | Arrastra | | 1¼ |
| ay | Water | 1 | Arrastra | | 1 |
| azourka Cañon | | 11 | Dry-Washer | | |
| cEvoy | Steam | 1 | Arrastra | | 1 |
| ute | Water | 1 | Arrastra | | |
| olita | Water | 1 | Arrastra | | |
| ed Chief | Water | 1 | Arrastra | | |
| p Top | Water | 1 | Arrastra | | |
| mbstone | Water | 1 | Arrastra | | |

CUSTOM WORKS IN INYO COUNTY.

Waterman's Mill. (No data.)

## Kern County.

During the last two years the mining industry in Kern County has experienced a great revival. In the older camps, as White River, Kern River, Havilah, and Caliente, the old mines are being reopened and operated by men with capital, and many of them will, no doubt, make steady producers.

Although the discoveries of placer gold in Goler, Red Rock, and Summit, described in our XIIth Report, p. 456, have not been of much importance in themselves, they have attracted prospectors to that part of the county, and the discovery of the Randsburg district is the result. The Randsburg range is a long, low ridge of hills in the desert, running north and south, about 35 miles long and 3 to 6 miles wide. Its southern extremity reaches to a point about 20 miles N.E. of Mojave. The ridge is an uplift of diorite to a height of 1,000′ to 1,500′ above the level of the surrounding desert, and is flanked by heavy beds of metamorphic rocks (hornblende schists), dipping as much as 45° in places away from the center of eruption. The gold is found in quartz veins in the diorite, running, seemingly, at different courses. Not enough underground exploration has been done to form an idea of their relative position or connection. Just east of the town of Randsburg, a strong vein of white glassy quartz, running N.W. and S.E., and dipping nearly vertically, outcrops 10′ to 12′ above ground, and many others of similar nature and strike occur in the vicinity. None of them shows a trace of gold. The gold-bearing veins contain a dirty yellow or dead white quartz, and

strike at different courses. Which of the two series is the older has no been determined.

Several of the discoveries are on large and rich veins, and will, n doubt, make good mines. New finds are reported frequently, and th future of Randsburg, as a large gold-producer, seems promising.

The valley lands are made productive by an extensive irrigation sys tem. Agriculture, horticulture, and the following mineral industries ar important sources of revenue: liquid and rock asphaltum, on the west ern side of the valley; limestone, near Tehachapi; antimony, in Sa Emidio Cañon; and undeveloped impure gypsum deposits in the foot hills on the western side of the valley.

*Alta Queen Mine* (Quartz).—It is at the head of Grizzly Gulch, 5 mile S.E. of White River, at 3,600′ elevation. The vein is 6″ wide, and dip 40° S. in granite. The development consists of a 300′ tunnel an several small openings. D. Towsley, of White River, Tulare County owner.

*Ashford Mines* (Quartz).—This group is 1½ miles E. of Randsburg at 3,800′ elevation, and comprise the *Eagle's Nest*, *Fairy Prince*, *Fair Queen*, *Hector*, *King Solomon*, *Magpie*, *Miranda*, *Pinmore*, *Rocket*, an *Wasp*. The veins are small, 6″ to 12″ wide, and have a general cours of S.E. and N.W. Only surface work is done on any of them. Ashfor Bros. Co., of Randsburg, owners.

*Bald Eagle Mine* (Dry Placer).—See Goler District.

*Bald Eagle Mine* (Quartz).—It is 3 miles N.E. of Havilah. Idle Dan Doherty, of Havilah, owner.

*Barton Mines* (Quartz).—They lie on Piute Mountain, 9 miles N.E of Piute. A 5-stamp steam-power mill belongs to the property. S Barton, of Claraville, owner.

*Bear Track Flat Mine* (Hydraulic).—It is on Greenhorn Mountain 7 miles N.W. of Havilah, at 5,150′ altitude, and contains 20 acres Water is taken from Greenhorn Creek by ½ mile of 2′x 2′ ditch. Th outfit consists of 200′ of 8″ pipe, 100′ of 7″ hose, and a 2″ nozzle. Th pressure is 30′, and the bank of gravel averages 3′ in thickness. J. B Calland, of Woody, owner.

*Bella Rufin* (*Berry*) *Mine* (Quartz).—See our XIIth Report, p. 142. I is 2 miles W. of Piute, at 3,000′ altitude. The vein occurs in granite is 2′ wide, strikes N. 65° W., and dips 50° N.E. It is developed by 75′ shaft with short drifts. Stuter & McKay, of Amalie, owners.

*Bevel Mine* (Quartz).—See Isabella Extension.

*Big Blue* (*Sumner*) *Mine* (Quartz).—See our VIIIth and XIIt Reports, pp. 315 and 142. It is 1 mile N. of Kernville, at 2,750′ eleva tion, and embraces eleven claims on the *Big Blue* vein and seve claims located on a series of smaller veins, from 4″ to 36″ thick, whic run into the Big Blue vein from the north, at an angle of about 60° The former are named the *Big Blue*, *Commonwealth*, *Content*, *Nelly Dent Nelly Dent Extension*, *Sumner*, and *Sumner 5 Extensions*. The latter ar the *Beauregard*, *Bull Run*, *Frank*, *Jeff Davis*, *Lady Bell*, and *Urbana* The mine is practically idle, only tribute work being done. An 80-stam water-power mill belongs to the property. Thomas Price & Co., of Sa Francisco, owners; Benjamin Price, of Kernville, superintendent.

*Big Bonanza Mine* (Quartz).—It is on Basin Creek, 5 miles N. o Caliente. Development consists of a tunnel 80′ long, and a shaft 40

eep. The vein is 4′ wide, is filled with crushed talcose material carrying old, and dips 65° N.W. in granite. J. B. Ferris, of Caliente, owner.

*Big Horse Mine* (Quartz).—See Olympus.

*Blackfoot Mine* (Quartz).—It is near the Long Tom, 23 miles N.E. of akersfield, at 1,500′ elevation. The vein lies in granite, dips 45° N., nd averages about 12″ in width. The shaft is 80′ deep, with drifts both ays, about 60′ long. A. T. Tucker, of White River, Tulare County, wner.

*Blackhawk Mine* (Quartz).—It is 3 miles S.E. of Randsburg, at 3,000′ ltitude. There are three parallel veins a short distance apart, each bout 18″ wide, and dipping 50° E. The development consists of a 100′ haft on the vein, and a 150′ drift on the 60′ level. D. C. Kuffel, of andsburg, owner.

*Black & Sullivan Mine* (Placer).—See Red Rock District.

*Blue Mountain Mine* (Quartz).—See our XIIth Report, p. 296. It is miles S.E. of White River, at 3,600′ elevation. The vein is 4″ to 16″ hick, dips 85° S., and lies in granite. It is developed by a 45′ shaft nd a 25′ drift. J. C. McDonald, of White River, Tulare County, wner.

*Bob Lee Mine* (Quartz).—See our XIIth Report, p. 142. It is 2 miles V. of Kernville, at 2,660′ altitude. Idle. Robinson Bros., of Kernville, wners.

*Bonanza Mines.*—See Red Rock District.

*Bright Star Mine* (Quartz).—See our XIIth Report, p. 142. It is 13 niles N.E. of Piute. Idle. Parke & Lacy, of San Francisco, owners.

*Brogan Mine* (Quartz).—See our XIIth Report, p. 142. It is 2 miles . of Piute, at 3,380′ altitude, and embraces three claims. The vein is ′ wide, with 6″ to 12″ of quartz. The walls are porphyry, and the dip s 65° N.E. A new shaft has been sunk 80′, and a drift is being run rom the bottom. Wm. Shipsey, of Piute, owner.

*Bullion Mine* (Quartz).—See our XIIth Report, p. 143. It is 1 mile V. of Claraville. Albert Bartholomy, of Onyx, owner.

*Burcham Mine* (Quartz).—See Olympus.

*Burdette Mine* (Quartz).—It is in Long Tom Gulch, 27 miles N.E. of Bakersfield, at 1,870′ elevation. The vein occurs in granite, and dips 45° N. A 70′ shaft and several surface cuts disclose 6″ to 12″ of quartz. Henry Burdette, of Bakersfield, owner.

*Butte Mine* (Quartz).—It is in Fiddler's Gulch, 1 mile N. of Randsburg, at 3,500′ elevation, and is a recent and promising location. The vein is 3′ wide and dips 80° N. in a dioritic rock. Near the hanging-wall is a 4″ to 6″ streak of white quartz, showing free gold throughout; the rest of the vein matter is a crushed quartz, mixed with talc, also rich in gold. There are two 50′ shafts on the claim and several open cuts. The surface debris below the cropping is being run through a dry-washer, and the coarse material is picked over by hand to save the rich quartz float. The gold is free, and no sulphurets are visible. There is no water in the vicinity, and the ore is hauled to a stamp mill at Cow Wells, 20 miles away. The milling charges are $15 per ton. Wages are $2 a day and board. Freight from Mojave is 75 cents per cental. Lumber costs $40 per M. Firewood is hauled from Tehachapi, 75 miles distant, and water costs 5 cents a gallon. H. C. Ramie et al., of Randsburg, owners.

*Butte Wedge Mine* (Quartz).—It is the west extension of and contain about 70′ of the Butte vein, and between it and the Kenyon Mine tunnel is being run to find the vein. H. Kearns and J. Dillon, o Randsburg, owners.

*California Mine* (Quartz).—See Olympus.

*Canfield Mines* (Placer).—See our XIIth Report, p. 143. They com prise fifty-one claims in Bonanza Gulch, 2 miles E. of Red Rock. N water brought to them yet. Canfield Mining Co., of Los Angeles, owner

*Champion Mine* (Dry Placer).—See Red Rock District.

*Champion Mine* (Quartz).—It is 7 miles S.E. of White River, at 1,420 altitude. The vein, 4″ to 12″ wide, lies in granite and dips 80° S. I is developed by a 100′ tunnel, with drifts 60′ and 40′ long. Andrew Monroe, of White River, Tulare County, owner.

*Chief Mine* (Quartz).—It is ½ mile E. of the Long Tom, and 25 miles N.E. of Bakersfield, at 1,850′ altitude. The development consists of two tunnels, 250′ and 300′ long, with a 60′ winze at the end of the longer one. The vein is 8″ to 24″ wide, and dips 30° S.E. in granite. D. M. Tressel, of Bakersfield, owner.

*Cincinnati Mine* (Dry Placer).—See Goler District.

*Clay Bank Mine* (Quartz).—It is 1 mile W. of Havilah, at 4,170′ altitude. A cross-tunnel, 1,000′ long, and some 1,500′ of drifts, constitute the developments. Has been idle several years. Charles E. Sherman, of Havilah, owner.

*Colorado* (*Morning Star*) *Mine* (Quartz).—See our XIIth Report, p. 146. It is in Grizzly Gulch, 4 miles S.E. of White River, at 1,410′ elevation. There are two tunnels, 60′ and 75′ long, on the vein, which dips 45° S.E. in granite, and varies from 4″ to 36″ in width. E. A. Gates, of White River, Tulare County, owner.

*Comet Mine* (Quartz).—It is on Fremont Gulch, 8½ miles N.W. of Havilah, at 4,950′ altitude. The vein is 8″ wide, and dips 45° S.E. in granite. The development consists of a 50′ shaft and a 50′ tunnel on the vein. Andrew McNitt, of White River, Tulare County, owner.

*Davis Mine* (Quartz).—It is 25 miles N.E. of Bakersfield, at 1,850′ elevation. The vein is 2′ wide, and dips 45° N. between granite walls. A cross-cut tunnel is being driven to tap the vein. William Davis, of Bakersfield, owner.

*Dead Tree Mine* (Quartz).—It is on Cottonwood Mountain, 6 miles N.E. of Piute, at 6,000′ elevation. There are two shafts, 20′ and 30′ deep, and several open cuts on the claim. The vein is 3″ thick, dips 40° S. between granite walls. The ore is treated in a horse-power arrastra. John Hutchins, of Piute, owner.

*Defender Mine* (Quartz).—This is one of the new discoveries in the Mojave Desert, ¾ mile E. of Randsburg, at 4,550′ altitude. A strong vein of rich quartz is exposed in an open cut. E. B. Maginnis et al., of Randsburg, owners.

*Dolly Mine* (Quartz).—See our XIIth Report, p. 143. It lies 14 miles E. of Caliente, at 2,960′ elevation. Idle. A. Souser, of Caliente, owner.

*Dos Picannini Mine* (Quartz).—It is in Fiddler's Gulch, 1 mile E. of Randsburg, at 3,400′ elevation. The development consists of a shaft 40′ deep, following the vein on a slope of 40° S. It is an extension of the Maria and on the same vein. Benson Bros. et al., of Randsburg, owners.

*Dreadnaught Mine* (Quartz).—See Hardtack.

*Eagle's Nest Mine* (Quartz).—See Ashford.

*Eclipse No. 1 Mine* (Quartz).—It is 1½ miles N.W. of Woody, at 1,400′ titude. The 12″ vein stands vertically in granite. The new develop- ent consists of a cross-cut tunnel 60′ long, and 50′ of drifts at the ottom of a 50′ winze. A. Weil, of Bakersfield, owner.

*Elsy & Groves' Mine* (Quartz).—It is near Kern River, 4 miles S. of abella, at 2,480′ altitude, and is on a vertical vein in granite, 4′ wide. is worked through a tunnel 600′ long. Elsy & Groves, of Isabella, wners.

*Emerald Mine* (Quartz).—See our XIIth Report, p. 143. It is 4½ iles N.E. of Piute, at 4,700′ elevation. The older workings being ooded, a drain tunnel has been started. It will be 300′ long and tap e vein 100′ below the deepest stopes. The vein is 5′ to 7′ thick and ips 85° S. in granite. J. B. Ferris, of Caliente, owner.

*Empire Mine* (Quartz).—It is on Greenhorn Mountain, 8 miles N.W. Havilah, at 5,500′ altitude. The development consists of three shafts, 5′, 65′, and 50′ deep, with a drift in the bottom of the latter, 90′ long. he vein is 8″ wide, dips 45° S.E. in granite. F. F. Boettler, of Woody, wner.

*Exchange Mine* (Dry Placer).—See Goler District.

*Fairy King Mine* (Quartz).—See Ashford.

*Fairy Queen Mine* (Quartz).—See Ashford.

*Flying Dutchman Mine* (Quartz).—It is 4 miles S. of Havilah, at ,400′ elevation. The claim is located on a 12″ vein, in granite, dipping 0° E. A 150′ tunnel and an 80′ shaft constitute the development. ohn Hayes, of Havilah, owner.

*Friday Mine* (Quartz).—It is 2 miles N.W. of Havilah, at 4,400′ alti- ude, and is located on an 18″ vein, dipping 85° E. in granite. Devel- ped by a 150′ shaft and several short tunnels. Jacob Estlebaum, of Iavilah, owner.

*Garlock's Custom Mill.*—It is at Caldwell, 30 miles N. of Mojave, at ,420′ altitude, and has 8 stamps of 750 lbs. weight, using No. 9 slot creens. Only 4 stamps are running about two hours per day, for want f water. Water is obtained from a bored well, 200′ deep. A shaft is eing sunk to provide water enough to run the full mill night and day. Vood is hauled 60 miles, from Tehachapi. U. S. Garlock, of Mojave, wner.

*G. B. Mine* (Quartz).—It is a recent discovery in the desert, near the Blackhawk, 2½ miles S.E. of Randsburg, at 3,200′ elevation. A 30′ haft exposes a 3′ vein of quartz inclosed in diorite, and dipping 45° N.E. Richard Powers et al., of Randsburg, owners.

*Gilbert Mine* (Quartz).—It is on Greenhorn Mountain, 15 miles S.W. f Isabella, at 5,550′ elevation. The vein is 16″ wide, dips 45° E., and ontains quartz carrying silver and gold. There is an incline shaft 40′ eep, and some open cuts on the vein. William Gilbert, of Isabella, wner.

*Glen Olive Mines* (Quartz).—This group is on Badfish Creek, 9 miles N.E. of Havilah, and embraces seven claims. Development consists of hree tunnels, 100′, 150′, and 200′ long, on the vein. The vein is 6″ to ′ wide, and the quartz contains a heavy percentage of sulphurets. Wales L. Palmer, of No. 237 First Street, San Francisco, owner.

*Golden Mine* (Quartz).—It is 7 miles E. of Caliente, and consists of a 5′ tunnel driven into a mass of quartz, 100′ in width. J. B. Ferris, of Caliente, owner.

*Goler Consolidated Placer and Hydraulic Co.'s Mines* (Dry Placer).—They lie in the vicinity of Goler. A large ditch, taking water from Owens River, was projected. It was to bring 1,000 cu. ft. of water per second into the desert for the purpose of washing the extensive gravel beds near Goler. The project was abandoned, owing to lack of funds.

*Goler District.*—See our XIIth Report, p. 456, for a detailed description. It lies 45 miles N. of Mojave, in the hills bordering the desert on the east. Dry-washing is still being prosecuted in a small way, and it is stated that wages of $1 to $1 50 per day can be made with a good machine. The following claims are being worked:

| | |
|---|---|
| Bald Eagle No. 1 | Owned by Frank Nugent, of Mojave. |
| Bald Eagle No. 2 | Owned by Robert Witcher, of Randsburg. |
| Cincinnati | Owned by M. R. Williams, of Randsburg. |
| Exchange | Owned by Arch. Martin, of Randsburg. |
| Lookout | Owned by Alf. Heath, of Randsburg. |
| Racket | Owned by Gunnison et al., of Randsburg. |
| Rattler | Owned by D. C. Kuffel, of Randsburg. |
| Sandturtle No. 1 | Owned by Kuffel & Harkins, of Randsburg. |
| Sandturtle No. 2 | Owned by E. Baker, of Randsburg. |

The claims all lie within a square mile around Goler. About twelve dry-washer machines are in use.

*Good Luck Mine* (Quartz).—It is near the Long Tom, 23 miles N.E. of Bakersfield, at 1,450′ altitude. The vein occurs in granite, is 8″ thick and dips 45° N. A 200′ tunnel and a 60′ and a 70′ shaft on the vein constitute the development. The ore is treated in a horse-power arrastra. A. P. Tucker, of White River, Tulare County, owner.

*Green Mine* (Quartz).—It is near Kern River, 4 miles S. of Isabella, at 2,420′ elevation. A 150′ shaft, with short drifts at the bottom, has been sunk on an 8″ vein of quartz, dipping 75° E. in granite. T. N. Stebbins, of Isabella, owner.

*Grizzly Mine* (Quartz).—See our XIIth Report, p. 144. It is on Grizzly Gulch, 4 miles S.E. of White River, at 1,410′ altitude. Only shallow surface work has been done since our last Report. George Duffy et al., of San Francisco, owners.

*Hanover Mine* (Quartz).—See our XIIth Report, p. 144. It is on Cottonwood Mountain, 6 miles N.E. of Piute, at 5,880′ altitude. The vein is 8″ thick, and dips 45° S. between granite walls. A new tunnel, 150′ long, has been driven on the vein, and some stoping done. The quartz is crushed in a horse-power arrastra. Robert Paehlig, of Piute, owner.

*Haight Mine* (Quartz).—It is 4 miles E. of Havilah. Idle.

*Hardtack* (*Dreadnaught*) *Mine* (Quartz).—See our XIIth Report, p. 143. It is in Grizzly Gulch, 4 miles S.E. of White River, at 1,340′ altitude. There are five shafts, from 25′ to 90′ deep, on this claim. A cross-cut drain tunnel is being driven. It is 300′ long, and has not cut the vein yet. The country rock is granite, and the vein varies from 6′ to 36′ in thickness, dipping 45° S.E. Thomas Kitchen, of White River, Tulare County, owner.

*Harrison Mine* (Quartz).—See Mammoth.

*Harvest Home Mine* (Quartz).—It is 2 miles S. of White River, at 2,250′ elevation, and is a new location on an 8″ quartz vein between vertical granite walls. James Beaver, of White River, owner.

*Hattie and Isabella Mines* (Quartz).—They lie near the Long Tom, 25 miles N.E. of Bakersfield, at 1,700′ elevation. Idle. L. S. Johnston, of Visalia, owner.

*Hawkeye Mine* (Quartz).—It lies 2¾ miles S.E. of Randsburg, at 3,100′ altitude, and is one of the new discoveries in the desert. A 12′ shaft has been sunk on a 2′ vein, dipping 45° N.E., and lying between diorite walls. P. O. Fifield, of Randsburg, owner.

*Hector Mine* (Quartz).—See Ashford.

*Henrietta Mine* (Quartz).—See our XIIth Report, p. 144. It lies near Amalie, 18 miles N. of Caliente. Idle.

*Hillside Mine* (Quartz).—It is in the "slate range," 5 miles S.W. of White River, at 1,250′ altitude, and is an extension of the Sunset. The vein is being traced on the surface. P. C. Montgomery, of Porterville, owner.

*Hooper & Tibbetts's Custom Mill* is at Isabella, at 2,350′ elevation. Its 5 stamps, of 750 lbs. each, are driven by a 24″ turbine with water taken from Kern River. Hooper & Tibbetts, of Isabella, owners.

*Hubbard Mine* (Quartz).—See our XIIth Report, p. 145. It is 4½ miles N.E. of Piute, at 4,700′ elevation. Idle. J. B. Ferris, of Caliente, owner.

*Ida Mine* (Quartz).—It is on Greenhorn Mountain, 8 miles N.W. of Havilah, at 5,600′ altitude. The vein is 20″ thick, and dips 45° S.E. between granite walls. It is developed by a 40′ and a 75′ shaft. The quartz is crushed in a horse-power arrastra. F. F. Boettler, of Woody, owner.

*Indian Queen Mine* (Quartz).—It is on Long Tom Gulch, 27 miles N.E. of Bakersfield, at 1,840′ altitude. A 40′ shaft, with a 30′ drift each way, is sunk on an 18″ vein dipping 45° N. between granite walls. Theodore Wiley, of Bakersfield, owner.

*Isabella Extension* (*Bevel*) *Mine* (Quartz).—It is near the Long Tom, 23 miles N.E. of Bakersfield, at 1,750 elevation. The vein is 10″ wide, and dips 45° N. between granite walls. Developed by a 100′ shaft, with drifts both ways, 80′ long. A. P. Tucker, of White River, Tulare County, owner.

*Isian Camp Mine* (Placer).—See our XIIth Report, p. 145. It is in Grizzly Gulch, 6 miles S.E. of White River, at 1,140′ elevation, and is worked by ground-sluicing. A. J. Williams, of White River, Tulare County, owner.

*Josephine Mine* (Quartz).—See our XIIth Report, p. 145. It is in the "slate range," 5 miles S.W. of White River, at 1,320′ altitude. The development consists of a 65′ and a 150′ shaft and some short drifts. The vein is 8′ thick, and shows several small stringers of rich quartz. The dip is 65° N.E., and the wall-rock mica schist. A whim is used for hoisting. F. E. Barette, of White River, Tulare County, owner.

*Juan Dosie Mine* (Quartz).—See our XIIth Report, p. 145. It is 1½ miles S.W. of Piute, at 3,510′ elevation. It has been idle for some time, but lately drifting from the bottom of the shaft has been resumed. A steam-power arrastra grinds the rock. Sutter & McKay, of Amalie, owners.

*Kenyon Mine* (Quartz).—It lies 1 mile N.E. of Randsburg, at 3,450′ elevation. It is a new discovery, and lies on the same vein as the Butte. The vein is 4′ wide, and is exposed in an incline shaft 30′ deep. The quartz shows free gold, and is very rich. Kenyon & Sons, of Randsburg, owners.

*Keyes Mine* (Quartz).—See our XIIth Report, p. 145. It is 9 miles S.W. of Kernville, at 2,310′ altitude. Idle. T. N. Stebbens, of Isabella, owner.

*King Solomon Mine* (Quartz).—See Ashford.

*Little Angel* (*Warrington*) *Mine* (Quartz).—It is 1 mile W. of Havilah, at 4,150′ altitude. The lowest and latest workings consist of a 300′ tunnel and a 250′ winze at its end. A shaft being sunk to strike the winze was, in May last, 300′ deep. A small steam hoist is used. The vein is 2′ to 8′ wide, and dips 70° E. in granite. Patrick O'Brien, of Havilah, owner.

*Little Blue Mine* (Quartz).—It is on Green Mountain, 6½ miles N.W. of Havilah, at 5,200′ elevation, and is a new location. An open cut, 15′ deep, discloses an 8″ vein of quartz showing free gold. The country rock is granite. Frank and Charles Hitchcock, of Woody, owners.

*Little Butte Mine* (Quartz). — It is 1 mile N.E. of Randsburg, at 3,400′ altitude, and adjoins the Kenyon. It is a new location. Surface cuts are being made to trace the vein. H. C. Ramie et al., of Randsburg, owners.

*Long Tom Mine* (Quartz).—It is 25 miles N.E. of Bakersfield, at 1,620′ altitude, and embraces the following patented claims: *Antrim*, *Belle*, *Daisy*, *Hirschfeld*, *Lady Langtree*, and *Webb*. The principal developments are on the Lady Langtree ground, where an incline shaft 500′ deep has been sunk. The pay-shoot is 150′ long, lies south of the shaft, and pitches nearly vertically. Above the 300′ level the pay-shoot has been stoped. The 400′ level is 140′ long, and is partly stoped, while the 500′ level is 150′ long, ready to stope. Near the surface the vein is about 16″ wide, while on the 500′ level it is 20′ wide. It dips 45° W. between a diabase foot-wall with 3″ of clay and a granite hanging-wall with 10″ to 12″ of blue clay containing sulphurets. The vein matter is a short-grained, partly crystallized quartz, with 7% sulphurets. The steam hoist has a 16″x 30″ drum, a 7″x 14″ cylinder, and uses a ⅝″ steel rope. A 50 H.P. engine is used for pumping, and to run the fan. About 4,500 gals. of water are raised per day. A 20-stamp mill is partly on the ground. Water for power will be taken from the ditch of the Poso Creek Irrigation Co., which runs about 100′ above the mill. The Daisy is the south extension of the Lady Langtree; the others are locations on small veins about 1,000′ E. of the main shaft. On the Webb ground there are several tunnels, driven on a vein of quartz 6″ to 30″ thick, lying nearly horizontally between granite walls. Herman Hirschfeld, of Bakersfield, owner; D. M. Tressel, of Bakersfield, superintendent.

*Lookout Mine* (Dry Placer).—See Goler District.

*Los Angeles Placer Mining Co.'s Mine* (Dry Placer).—See Red Rock District.

*Lucky Cuss Mine* (Quartz).—See our XIIth Report, p. 297. It is 3 miles S. of White River, at 2,640′ altitude. The vein is 6″ to 8″ thick, and stands vertically between granite walls. There is a 200′ tunnel and a 30′ shaft on the vein. B. Allen, of White River, Tulare County, owner.

*Lucky Joe and Sullivan Mines* (Quartz).—They are at the head of Caliente Creek, 4 miles N.E. of Piute, at 5,100′ altitude, and are new locations on a very large vein of quartz. A cross-cut tunnel, 80′ long, partly penetrates the vein. The quartz is treated in a horse-power arrastra. W. J. Thornton et al., of Piute, owners.

*Mace Mine* (Quartz).—See our XIIth Report, p. 146. It is on Pah-Ute Mountain, 6 miles N.E. of Piute, at 6,575′ altitude. Developed by

everal shafts, 60′ to 80′ deep, connected by drifts. The vein averages ″, and dips 40° S.E. in granite. Hugh Mann, of Piute, owner.

*Magpie Mine* (Quartz).—See Ashford.

*Mamie Mine* (Quartz).—See our XIIth Report, p. 146. It is 5 miles .W. of Kernville, at 2,460′ elevation. A 300′ tunnel is driven on a 6″ ein of rich quartz, dipping 85° E. in granite. Mrs. Ross, of Kernville, wner.

*Mammoth* (*Harrison*) *Mine* (Quartz).—It is 7 miles S.W. of Kernille, at 2,440′ elevation, and embraces the *Burdette*, *Little Mammoth*, *Mammoth*, and *Tom Lane* claims. The vein is 10′ thick, with a paytreak 18″ to 20″ wide near each wall, and dips 85° E. between granite valls. After lying idle for several years the mine is being prospected horoughly by a series of tunnels on the vein. Fred Tibbetts et al., of sabella, owners.

*Mammoth* (*Sovereign*) *Mine* (Quartz).—See our XIIth Report, p. 147. It is 1 mile W. of Havilah, at 4,150′ elevation. Idle. Max Helmes et l., of Havilah, owners.

*Marguerite Russell Mine* (Quartz).—It is 2 miles S.W. of Havilah, at 3,820′ altitude. The 24″ vein occurs in granite, and dips 85° E. There s a 60′ shaft, with short drifts, and several open cuts on the claim. E. Shipsey & Co., of Havilah, owners.

*Maria Mine* (Quartz).—It is in Fiddler's Gulch, 1 mile E. of Randsburg, at 3,400′ elevation. It is a new discovery on a 10″ to 24″ quartz vein, dipping 40° S. The incline shaft is 40′ deep. Benson Bros. et al., of Randsburg, owners.

*Mariposa Mine* (Quartz).—See Olympus.

*Mayflower Mine* (Quartz).—It is on Greenhorn Mountain, 7 miles N.W. of Havilah, at 5,420′ elevation. The vein is 10″ thick, and dips 40° E. between granite walls. A 56′ and a 90′ shaft are the developments. Joseph Waugaman, of Woody, owner.

*Mayflower Gulch Mine* (Placer).—It is on Green Mountain, 7 miles N.W. of Havilah, at 5,000′ altitude, and contains 20 acres. Water is taken from Greenhorn Gulch by 2 miles of 2′x 2′ ditch. The gravel is 18″ to 2′ deep, and is worked by ground-sluicing. F. F. Boettler, of Woody, owner.

*McClellan Mine* (Quartz).—It is on Green Mountain, 7 miles N.W. of Havilah, at 5,700 altitude. The developments consist of two shafts, 80′ and 45′ deep, and a 140′ tunnel. The 24″ vein occurs in granite, and dips 45° S. The quartz is crushed in a steam-power arrastra. C. C. Stockton, of Bakersfield, owner.

*McKidny Mine* (Quartz).—It is two miles W. of Havilah, at 4,000′ elevation. The vein is 18″ thick, and dips 75° E. between granite walls. There are several shallow shafts on the claim. Idle. T. Candy, of Havilah, owner.

*Mesa Mine* (Drift).—It lies in the gravel wash below Goler Cañon, 6 miles N.W. of Randsburg. A shaft was sunk to prospect the bedrock, but when a depth of 367′ was reached, water stopped all further progress. The material passed through consists of gravel and bowlders, and carries gold all the way down. The water in the shaft is said to be good, but no use is made of it at present. A whim was used for hoisting. D. C. Kuffel et al., of Randsburg, owners.

*Miranda Mine* (Quartz).—See Ashford.

*Missouri* (*Sarah Tucker*) *Mine* (Quartz).—It is in the "slate range," 5 miles S.W. of White River, at 1,170′ elevation, and is a vertical contact vein between granite on the east and mica schists on the west. The vein is 6″ thick, and is developed by a 75′ tunnel and a 12′ and a 40′ shaft. P. C. Montgomery, of Porterville, owner.

*Monarch Mine* (Quartz).—It lies at the head of Caliente Creek, 4 miles N.E. of Piute, at 5,000′ altitude. The 12″ vein lies in granite, and dips 80° S.E. There is a 60′ shaft connecting with a 150′ tunnel. W. J. Thornton et al., of Piute, owners.

*Mooers Mine* (Quartz).—See Olympus.

*Morning Mine* (Quartz).—It is at the head of Caliente Creek, 4 miles N.E. of Piute, at 5,250′ elevation. A 30′ shaft is sunk on a 12″ to 20″ vein, which dips 45° S.E. between granite walls. W. J. Thornton, of Piute, owner.

*Nancy Hanks Mine* (Quartz).—See Olympus.

*New York Mine* (Dry Placer.)—See Red Rock District.

*New World Mine* (Quartz).—It is 1 mile W. of Havilah, at 4,230′ altitude, and contains an 8′ vein dipping 70° E. The development consists of a 105′ shaft, and a cross-cut tunnel, to be 400′ long, has been started. G. Miller and J. B. Coulston, of Havilah, owners.

*None Such Mine* (Quartz).—See our XIIth Report, p. 146. It is in Grizzly Gulch, 4 miles S.E. of White River, at 1,440′ elevation. Rock is being extracted from near the surface and treated in a horse-power arrastra. A. R. Sorrells, of White River, Tulare County, owner.

*Olympus Mines* (Quartz).—This group lies ½ mile E. of Randsburg, at 4,450′ elevation, and comprises the *Big Horse*, *Burcham No. 1 and No. 2*, *California*, *Mariposa*, *Mooers*, *Nancy Hanks*, *Olympus*, *Rand*, *Singleton*, *Tennessee*, and *Trilby*. Gold was discovered in the Randsburg Hills in the spring of 1895, and this group contains the first locations. The veins are large and very rich, but owing to the want of milling facilities very little work has been done. There seems to be two parallel veins, about 600′ apart, with quite a number of small stringers running at right angles between. The strike of the large vein is N.E. and S.W., and the dip 26° N.W. In the Olympus ground an open cut 40′ long and a 7′x14′ incline shaft, 30′ deep, discloses the vein, showing 14′ of dirty-yellow, high-grade quartz. The hanging-wall is diorite; the foot-wall has not been exposed. Several hundred tons of rich ore are sacked, awaiting the mill now being erected at Koehn's, 30 miles away, where a good supply of water (said to be 3 miner's inches) has been obtained in wells. F. M. Mooers et al., of Randsburg, owners.

*Ophir Mine* (Quartz).—It is 1 mile S.W. of Havilah, at 3,950′ altitude, and is developed by a 100′ tunnel with a winze at its end 100′ deep. The 3′ vein dips 70° S. in granite. A 5-stamp steam-power mill, using 650-lb. stamps and 40-mesh wire screens, belongs to the property. John Hayes, of Havilah, owner.

*Oro Fino Mine* (Quartz).—It is 2 miles N.W. of Havilah, at 4,310′ altitude. The vein is 18″ thick, and dips 85° E. Development consists of three tunnels, 80′, 150′, and 250′ long, with a winze in the latter, 60′ deep. There is a 300′ irregular upraise to the surface, for air. William Menzel, of Havilah, owner.

*Pine Tree Mines* (Quartz).—They are on the northern slope of a mountain in Secs. 3 and 4, T. 11 N., R. 15 W., 6 miles S. of Tehachapi, at about 5,000′ altitude, and consist of three connecting claims. The

Olympus Mine.

Randsburg.

ein, of partly decomposed quartz, is 2′ to 10′ wide (average 4′), dips 0° S.E., and is inclosed in decomposed granite. It is principally free-illing, and is worked in an arrastra. The mines are worked through ve tunnels, 60′, 80′, 85′, 120′, and 360′ long, respectively. Eight men re employed. W. C. Chormicle, of Tehachapi, owner.

*Pinmore Mine* (Quartz).—See Ashford.

*Pioneer Mine* (Quartz).—It is on Kern River, 4 miles S. of Isabella, t 2,320′ altitude. There is a 200′ tunnel on the vein and a 40′ and a 0′ shaft, with drifts in the bottom of the latter 50′ each way. The ein averages 12″ in width and dips 85° S.W. in hard granite. A water-ower arrastra belongs to the property. E. Vaughn, of Havilah, owner.

*Pluto Mine* (Quartz).—It is 2 miles S.W. of Havilah, at 4,200′ alti-ude. There are three veins on this property, the larger one being 18″ vide and dipping 85° E. in granite. It is developed by a 60′ shaft and a 180′ tunnel. Max Helmes, of Havilah, owner.

*Polka Dot Mine* (Quartz).—It is on Badfish Creek, 9 miles N.E. of Havilah. Two shallow shafts disclose a 4′ vein, dipping 20° N.E. between granite walls. E. Vaughn, of Havilah, owner.

*Pomona Mill and Mining Co.'s Mines* (Dry Placer).—See our XIIth Report, pp. 147 and 456. Abandoned.

*Portuguese Mine* (Quartz).—It is on the stage road, 4 miles W. of Walker. Quartz is taken from near the surface and treated in a horse-power arrastra.

*Queen Mine* (Quartz).—See Alta.

*Racket Mine* (Dry Placer).—See Goler District.

*Rand Mine* (Quartz).—See Olympus.

*Rattler Mine* (Dry Placer).—See Goler District.

*Red Rock District.*—Fully described in our XIIth Report, p. 456. It lies in the hills bordering the Mojave Desert, 20 miles N. of Mojave, at 2,300′ elevation. Dry-washer machines are used exclusively, and are said to pay wages. The following claims are being worked by the owners living in Red Rock:

| | Men at Work. | Machines. | Owner. |
|---|---|---|---|
| Black & Sullivan | 5 | 2 | Black & Sullivan. |
| Bonanza Group of 11 claims | 6 | 2 | J. J. McLaughlin. |
| Champion | 2 | 1 | Sam Le Voy. |
| Los Angeles Placer Mining Co. | 2 | 1 | Jeff Johns et al. |
| New York | 3 | 1 | Hartley & Hawthorn. |

*Republic Mine* (Quartz).—It is 2½ miles S.E. of Randsburg, at 3,150′ altitude. It is a new discovery on the same vein as the Hawkeye. P. O. Fifield, of Randsburg, owner.

*Resurrection (Rochefort) Mine* (Quartz).—It is 1 mile W. of Havilah, at 4,220′ altitude. The vein is from 1′ to 7′ wide, and dips 65° S. between granite walls. The development consists of a 120′ shaft with a 150′ drift at its bottom, and a winze 40′ deep at the end of the drift. Max Helmes, of Havilah, owner.

*Rip Rap Mine* (Quartz).—See Skinner.

*Rocket Mine* (Quartz).—See Ashford.

*Rough and Ready Mine* (Quartz).—It is on Greenhorn Mountain, 7 miles N.W. from Havilah, at 5,050′ altitude. The quite extensive older workings are abandoned. A new tunnel run to tap the vein below will be 600′ long, and was, in May, 1896, about 525′ long. The vein carries 12″ of rich quartz. Charles Lamant, of Kernville, owner.

*Rustler and San Diego Mines* (Quartz).—They lie ¾ mile E. of Randsburg, at 4,650′ elevation. They are new locations on the vein of the Olympus, which they adjoin. A 60′ tunnel is run into a mass or vein of gold-bearing quartz. E. B. Maginnis et al., of Randsburg, owners.

*Saginaw Mine* (Quartz).—It is 8 miles S. of White River, at 1,290′ altitude, and consists of a vertical 6″ vein between granite walls. On the claim are two 40′ shafts, with short drifts. G. W. King, of White River, Tulare County, owner.

*Santa Junta Mine* (Quartz).—It is on Long Tom Gulch, 27 miles N.E. of Bakersfield, at 1,920′ altitude. A. Herriera et al., of Bakersfield, owners.

*Sandstone Mine* (Quartz).—See our XIIth Report, p. 147. It is on Grizzly Creek, 6 miles S. of White River, at 3,600′ altitude. The vertical 6′ vein contains a crushed mass of wall-rock and gold-bearing quartz striking E. and W. between granite walls. It is developed by a 20′ shaft and a 100′ tunnel. Allen Sorrells, of White River, Tulare County, owner.

*Sandturtle Mine* (Dry Placer).—See Goler District.

*Sarah Jane Mine* (Quartz).—See our XIIth Report, p. 147. It is ¼ mile N. of Kernville, at 3,050′ elevation. Developed by a 60′ tunnel and a 200′ shaft, from the bottom of which levels extend 200′ S. and 60′ N. The vein is 4″ thick, and dips 80° N.E. Aug. Thede, of Kernville, owner.

*Sarah Tucker Mine* (Quartz).—See Missouri.

*Shoestring Mine* (Quartz).—It is 4 miles S. of Isabella, on Kern River, at 2,350′ altitude. The vein is 6″ thick, and dips 85° S.W. in granite. On the vein are a 30′ shaft and several open cuts. Idle. E. Vaughn, of Havilah, owner.

*Singleton Mine* (Quartz).—See Olympus.

*Skinner (Rip Rap) Mine* (Quartz).—See our XIIth Report, p. 147. It is 4 miles N.W. of Piute, at 4,580′ altitude. There is a new 100′ shaft, with two 50′ drifts at the bottom. The vein is 18″ thick, and stands vertically between granite walls. The quartz is treated in a steam-power arrastra. Hugh Mann, of Piute, owner.

*Slate Walls Mine* (Quartz).—It is 7 miles E. of Caliente. A 60′ shaft and 20′ drift disclose a vein 2′ wide. Orin Barr, of Visalia, owner.

*Sovereign Mine* (Quartz).—See Mammoth.

*Speedy Mine* (Quartz).—It is 7 miles S.W. of Kernville, at 2,440′ altitude. A 20″ vein is exposed by a surface cut. Fred Tibbetts, of Isabella, owner.

*St. Charles Mine* (Quartz).—It is 2 miles N.W. of Havilah, at 4,320′ altitude. The 2″ vein dips 85° E. in granite. A cross-cut tunnel is being extended to 330′, and will cut the vein 200′ below the surface; it is now 180′ long. An old 10-stamp steam-power mill, with 650-lb. stamps, belongs to the property. Pat Reese et al., of Havilah, owners.

*Summit District.*—Fully described in our XIIth Report, p. 458. It lies in the Mojave Desert, 65 miles N. of Mojave, at 3,300′ altitude. A few men are working in this district with dry-washers. It is said that 75 cents is an average clean-up per man per day.

*Sunrise Mine* (Quartz).—It is ½ mile S.W. of Havilah, at 3,800′ altitude. The developments consist of a 500′ tunnel and several shorter ones. The 3′ vein dips 85° E. Reese & Co., of Havilah, owners.

*Sunset Mine* (Quartz).—It is in the "slate range," 5 miles S.W. of White River, at 1,160′ elevation. A 10″ vein, dipping 80° S., is developed by a 130′ tunnel and a shaft now being sunk to meet it. The country rock is mica schist. Joe Mitchell, of White River, Tulare County, owner.

*Surplus Mine* (Quartz).—It is 10 miles E. of Piute. An 18″ vein is exposed in an open cut and in a short tunnel and shaft. J. B. Ferris, of Caliente, owner.

*Sycamore Springs Mine* (Quartz).—See our XIIth Report, p. 147. It is on Grizzly Creek, 5 miles S.E. of White River, at 1,300′ elevation. Idle. A. W. Monroe, of White River, Tulare County, owner.

*Talc Mine* (Quartz).—See our XIIth Report, p. 147. It is 8 miles S. of White River, at 1,340′ altitude. The development consists of a 400′ shaft, a 500′ tunnel on the 200′ level, and a 600′ one on the 300′ level. The vein on the bottom shows 10″ of quartz. The walls are granite and the dip is vertical. The rock is treated in a 3½′ Huntington mill. G. V. King, of White River, Tulare County, owner.

*Tennessee Mine* (Quartz).—See Olympus.

*Three Chimneys Mine* (Quartz).—It is 4 miles S. of Isabella, at 2,370′ elevation. An 8″ vein, dipping 75° E. in granite, is being mined in a 100′ tunnel with several short winzes. T. N. Stebbins, of Isabella, owner.

*Tip Top Mine* (Quartz).—It is 1½ miles W. of Havilah, at 4,460′ altitude. A new location. John Hayes et al., of Havilah, owners.

*Tip Top Mine* (Quartz).—It is on Caliente Creek, near Amalie, at 2,750′ elevation. There is a 40′ tunnel and a 10′ shaft exposing a 2′ vein dipping 80° S. J. B. Ferris, of Caliente, owner.

*Trilby Mine* (Quartz).—See Olympus.

*Two Oaks Mine* (Quartz).—It is 8 miles S. of White River, at 1,390′ elevation. The vein is 6″ thick and is developed by a 40′ shaft. G. W. King, of White River, Tulare County, owner.

*Veracity Mine* (Quartz).—See our XIIth Report, p. 147. It is 1 mile E. of Claraville. Idle. Barton & Patterson, of Weldon, owners.

*Vulture Mine* (Quartz).—It is 5 miles S. of White River, at 3,350′ elevation. The vein, dipping 20° S., is from 2′ to 3′ wide, with 6″ to 18″ of quartz, and lies between granite walls. A 340′ tunnel on the vein is stoped to the surface and is being extended. A. R. Sorrell, of White River, Tulare County, owner.

*Walker Mine* (Placer).—It is on Kern River, 4 miles S. of Isabella, at 2,200′ altitude. Water is taken from French Creek by a 2′ x 2′ ditch, 5 miles long. The gravel is 4′ deep and carries gold throughout. Worked by ground-sluicing. Walker & Sons, of Isabella, owners.

*Warrington Mine* (Quartz).—See Little Angel.

*Wasp Mine* (Quartz).—See Ashford.

*Water Mine* (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,400′ altitude. The vein occurs in granite, dips 85° S.W., and is from 6″ to 24″ wide. The developments are a shaft 100′ deep, with a 100′ drift in the bottom. Ore is being extracted at present from the surface in a cut 15′ deep by 200′ long. Paris & Gomez, of Havilah, owners.

*White Pine Mine* (Quartz).—See our XIIth Report, p. 148. It is on Badfish Creek, 9 miles N.E. of Havilah. The vein averages 24″ wide, and lies in a contact between limestone and granite, and dips 35° S.E.

Developed by a 100′ tunnel. The rock is treated in a water-power arrastra. B. V. Burton, of Kernville, owner.

*Williams's Custom Arrastra.*—It is on Grizzly Gulch, 4 miles S. of White River, at 1,240′ altitude. It is driven by a 10 H.P. engine, and averages 2½ tons of rock per day. R. A. Williams, of White River, Tulare County, owner.

*Williams Mine* (Placer).—It is on Fremont Gulch, 9 miles N.W. of Havilah, at 4,800′ altitude, and contains 20 acres. Worked by ground-sluicing. Ben Williams, of Woody, owner.

*Wood Mine* (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,370′ altitude. There are two shafts; one is 70′ deep with a 10′ drift, and the other is 40′ deep with 80′ of drifts. The vein carries 10″ of quartz, and dips 85° S.W. in granite. Paris & Gomez, of Havilah, owners.

*Woody Mine* (Quartz).—See our XIIth Report, p. 148. It is in the "slate range," 5 miles S.W. of White River, at 1,150′ altitude. Idle. Joe Mitchell, of White River, Tulare County, owner.

*Yankee Bullock Mine* (Placer).—See our XIIth Report, p. 148. It is on Grizzly Creek, 4½ miles S.E. of White River, and is worked by ground-sluicing. B. L. Tompkins, of White River, Tulare County, owner.

*Young America Mine* (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,250′ elevation. There are many old workings, now idle. The mine is worked from the surface in an open cut, 15′ deep and 1,000′ long. The vein averages 8″ in thickness, and dips 87° S.W. between granite walls. Frank Potts and William James, of Havilah, owners.

MILLS IN KERN COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. |
|---|---|---|---|---|
| Bartons | Steam | 5 | | |
| Big Blue* | Water | 80 | 850 | |
| Garlock | Steam | 8 | 750 | 3 |
| Hooper & Tibbetts | Water | 5 | 750 | 8 |
| Iconoclast† | | 5 | 850 | 8 |
| Long Tom | Water | 20 | 850 | 15 |
| Ophir | Steam | 5 | 650 | 6 |
| St. Charles | Steam | 10 | 650 | |

* Has 16 concentrators.
† Cyanide plant, 10 tons daily capacity.

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN KERN COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Amalie | Steam | 1 | Huntington | 5′ | 16 | 2<br>1 | Frue<br>Woodbury | | | | |
| Dead Tree | Horse | | Arrastra | | 1 | | | | | | |
| Goler District | | 12 | Dry-Washers | | | | | | | | |
| Good Luck | Horse | | Arrastra | | 1 | | | | | | |
| Hanover | Horse | | Arrastra | | 1 | | | | | | |
| Ida | Horse | | Arrastra | | 1 | | | | | | |
| Juan Dosie | Steam | | Arrastra | | 1½ | | | | | | |
| Lucky Joe | Horse | | Arrastra | | 1 | | | | | | |
| McClellan | Steam | | Arrastra | | 1½ | | | | | | |
| None Such | Horse | | Arrastra | | 1½ | | | | | | |
| Pioneer | Water | | Arrastra | | 1 | | | | | | |
| Pine Tree | | 2 | Arrastra | | 10 | | | | | | |
| Portuguese | Horse | | Arrastra | | ½ | | | | | | |
| Red Rock District | | 7 | Dry-Washers | | | | | | | | |
| Skinner | Steam | | Arrastra | | 1 | | | | | | |
| Summit District | | | Dry-Washers | | | | | | | | |
| Talc | Steam | 1 | Huntington | 3½′ | | | | | | | |
| White Pine | Water | | Arrastra | | 1 | | | | | | |
| Williams | Steam | | Arrastra | | 2½ | | | | | | |

## CUSTOM WORKS IN KERN COUNTY.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Garlock. (No data.) | | | | | | | | | | | |
| Williams | | | Arrastra | | | | | | | | |

## Lassen County.

*Afterthought Mine* (Quartz).—See our Xth Report, p. 274. This i situated about 2 miles W. of Susanville, at about 4,600′ elevation. Th 1,500′ by 600′ location carries an E. and W. vein between decompose granite walls about 12′ wide. Idle.

*Blue Bell Mine* (Quartz).—See our IXth and XIIth Reports, pp. 21 and 148. This mine is situated on Hayden Hill, at 6,400′ elevation. Th two veins vary from a few inches to 2′ wide, and course N. and S. an E. and W., crossing each other in a quartzite and breccia formation The former vein pitches about 45° E. At the crossing the vein carrie several narrow streaks of an ochery clay, said to yield $4 per pound A 3′x 4′ vertical shaft has been sunk about 100′, and a cross-cut run t the vein and a winze started on the crossing. The hoist is a horse-whim Ore has to be hauled 2½ miles to an arrastra on Willow Creek. Two mer are at work. Preston & Howard, of Hayden Hill, owners.

*Brush Hill Mine* (Quartz).—See our Xth, XIth, and XIIth Reports pp. 276, 241, and 148. It is situated on Hayden Hill, at 6,500′ eleva tion. Since our last Report, a 4½′x 5′ shaft has been sunk over 400′ deep west of the previous workings; 270′ vertically and then following 130′ or an incline. From the bottom, 80′ of cross-cut was run easterly to strik the vein. The ore is hoisted by a horse-whim and hauled 3 miles, a an expense of $1 per ton, to a small 5-stamp water-power mill. Tw loads, of 6 tons each, are hauled per day. Eight men are employed Frank Vander Elst et al., of Hayden Hill, owners; G. T. Stone, o Hayden Hill, superintendent.

*Evening Star Mine* (Quartz).—See our Xth and XIIth Reports, pp 276 and 149. Altitude, 6,400′. Since our last Report, the mine ha changed owners. Idle. — Schloesser et al., of Chicago, owners.

*Gold Belt Mine* (Quartz).—See our Xth and XIIth Reports, pp. 27 and 149. Idle.

*Golden Eagle Mine* (Quartz).—See our Xth and XIIth Reports, pp 275 and 149. It lies on the east side of the town of Hayden Hill, a 3,400′ elevation. Since our last Report no further exploitations hav been made; the block of ground west from the 220′ level to the botto has been blocked out and stoped, with some little stoping east of th shaft. A new gasoline hoisting-engine of 6 H.P. is to replace th horse-whim. A 32′x 24′ canvas plant has been added to the mill o Willow Creek. The company employs 8 men. — Schloesser et al., o Chicago, owners.

*Golden Gate Mine* (Quartz).—See our Xth Report, p. 274. This i about 5 miles S.W. from Susanville, at 4,800′ elevation. Idle. G. Bran ham et al., of Susanville, owners.

*Gopher Hill Mine* (Quartz).—See our XIIth Report, p. 150. It i ¼ mile S. from Hayden Hill, at 6,300′ elevation. The vein courses E and W. Work is carried on spasmodically. "Hand-mortar ore" i found here. Three men are at work. T. Jones and W. Dale, of South Fork, Modoc County, owners.

*Gray Eagle Mine* (Quartz).—See our Xth Report, p. 274.

*Hayden Hill Cons. Tunnel Co.'s Mine* (Quartz).—See our XIIth Report, p. 150. It is ½ mile E. from Hayden Hill, at 6,200′ elevation, and embraces a tunnel-right and four mining locations. Since our last

eport, the tunnel has been advanced 275′, making it 1,300′ long, and sting a little over $3 per foot; it has cut no large quartz bodies to date. gasoline-engine and Sturtevant blower, with wooden air-boxes, have en erected to furnish air and enable the tunnel to be continued. Five en are at work. An incorporated company of Bieber, owner; J. McCoy, Adin, Modoc County, superintendent.

*Hayseed* (*Don't Care, Uncle Billy*) *Mine* (Quartz).—See our XIIth eport, p. 151. It is about ¼ mile from Hayden Hill, on the east side the hill, at 6,300′ elevation. A horse-whim has been erected and the haft at the north end of the claim continued; some very high-grade ore as obtained in drifting westerly. A 10-stamp steam-power mill is in urse of erection. Four men are employed in the mine. S. Owen, Perrault, and J. White, of Hayden Hill, owners.

*Juniper Mine* (Quartz).—See our IXth and XIIth Reports, pp. 212 nd 150. It is situated on the west side of Hayden Hill, at 6,325′ eleva- on. Lessees have sunk the shaft to a depth of 400′ and drifted under ne old workings, but without developing anything of importance. Idle. McFarling et al., of Calistoga, Napa County, owners.

*Lone Pine Mine* (Quartz).—It is on the east flank of the Diamond Mountain range, about 6 miles S.W. from Susanville, at 4,200′ average evation, and contains two full claims on a 4½′ vein trending N.W., and ipping nearly perpendicularly in a granitic formation. This is a late iscovery, and a shaft has been sunk 100′ on the vein and short drifts n. A 10-stamp mill has been erected, to be driven by a 50 H.P. steam- ngine. Timber and water are plentiful and convenient. Sixteen men re employed. Judge J. Goodwin et al., of Quincy, Plumas County, wners.

*North Star* (*Fluent*) *Mine* (Quartz).—See our XIIth Report, p. 151. It situated north of the town of Hayden Hill, at 6,450′ elevation, and is n extension of the Evening Star. Near the middle of the claim, the . and S. vein has been excavated a couple of hundred feet in length nd 30′ in depth. Lately a shaft has been sunk 50′ on the south end of he claim to prove a vein of low-grade ore, but operations had to be uspended on account of water. The ore taken from the cut is of good rade. Three men are at work. W. T. Summers, of Hayden Hill, wner.

## MILLS IN LASSEN COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Brush Hill | Water | 5 | 650 | 5 | | | | | | |
| Evening Star | Water | 5 | 650 | 7½ | | | | | | |
| Golden Eagle* | | 10 | 650 | 12 | | | | | | 768 sq. ft. |
| Hayseed | | 10 | 750 | | | | | | | |
| Lone Pine | | 10 | | | | | | | | |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN LASSEN COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Blue Bell | Water | | Arrastra | | 1 | | | | | | |
| Golden Eagle | | 1 | Arrastra | | | | | | | | |
| Juniper | | | Arrastra | | | | | | | | |

## Los Angeles County.

In and near the Cedar Mountain Mining District there are eight mines in operation and three quartz mills have been erected. On Mount Gleason there are sixteen claims, and 3 miles N.W. of Acton two claims on which assessment work is regularly done. At and near the same localities there are many hundreds of claims which receive more or less attention at the hands of their owners. During 1895–96 twenty-five iron mines were located in the San Gabriel Mountains along the line of the proposed Salt Lake and Los Angeles Railroad. In the Soledad placers during 1895–96 but little work was done, owing to the small rainfall and to the fact that dry-washers did not prove remunerative. In the placer mines north of Newhall, mining has been carried on to a limited extent. Some mines are being operated on North Bald Mountain in the St. Anthony Mining District, about 28 miles E. of Palmdale, and the work has been principally development. A company has been organized to work auriferous sand on the seashore near Ballona.

*Allen's North American Reduction Works* are situated at Jefferson Street and Raymond Avenue, Los Angeles. The plant consists of one Allen's 50 H.P. boiler; one 4" Allen's crusher, of 10 tons capacity in twenty-four hours; one Allen's dry concentrator, of 40 tons capacity in twenty-four hours. Four men are employed. D. Allen, of No. 635 Hill Street, president; G. G. King, of No. 223 N. Los Angeles Street, manager.

*Big Horn Mine* (Quartz).—It is on North Bald Mountain, 28 miles E. of Palmdale. The developments consist of about 1,000′ of tunnels. Free-milling rock ore on surface and sulphurets below. Development work only. Three men are employed. Vincent, Delaney & Lockwood, owners; J. Lockwood, of No. 847 Buena Vista Street, Los Angeles, secretary.

*Black Cat Mine* (Quartz).—It lies 10 miles E. of Acton, at about 3,500′ elevation. Developments consist of about 2,000′ feet of open cuts, shafts, and tunnels. A 20-stamp water-power mill is connected with the mine. Twelve men are employed in development work. Pierson, Bell & Stamp, owners; J. Pierson, of Acton, superintendent.

*Buena Esperanza Mine* (Quartz).—It is 2 miles N.W. of Acton. There are three shafts, 50′, 80′, and 30′ deep. Six men are employed in development work. W. L. Hastings, of Acton, owner.

*Cahuenga Mine* (Quartz).—It is 7 miles N. of Los Angeles. There are four tunnels, 30′ to 75′ long, and two 20′ shafts. Assessment work only. Cahuenga Mining and Irrigation Co., owner; H. J. Lloyd, of No. 428 Byrne Building, Los Angeles, secretary.

*Called Back Mine* (Quartz).—On North Bald Mountain, 28 miles E. of Palmdale. Development work consists of several hundred feet of tunnels. Three men are employed. T. Carey and N. D. Shippey, owners; Thomas Carey, of No. 851 Buena Vista Street, Los Angeles, secretary.

*Cornet Mines* (Quartz).—These adjoining mines are 4 miles N.W. of Acton. There are two 250′ tunnels and a 40′ shaft. Three men are employed. T. H. Webb, of New York, owner; J. Flood Walker, of Acton, superintendent.

*Eagle Mine* (Quartz).—See our XIIth Report, p. 152. It is a patented claim 7 miles S. of Acton. There are two 50′ tunnels and two shafts 60′ and 100′ deep. The ore is free-milling on the surface; sulphuret below. A 5-stamp mill is on the ground. Work suspended in 1896 owing to an accident to the machinery. F. Mackey et al., of Wilson Block, Los Angeles, owners.

*Hawley, Drinkwater & Hansen Mines* (Quartz).—They are on Mount Gleason, about 8 miles from Acton, and comprise the *Bob Ingersoll*, *Bolney*, *Fraction*, *Freethinker*, *Gold Bullion*, *Golden Rule*, *Log Cabin*, and *Old Town* claims. Assessment work only. Hawley, Drinkwater & Hansen, of Acton, owners.

*Kelly's Mines* (Quartz).—They are on Mount Gleason, about 7 miles from Acton, and comprise the *Champion*, *Last Chance*, and *Padre*. Assessment work only. T. Kelly, of Acton, owner.

*Kelsea Mine* (Quartz).—It is situated 5 miles N. of Azusa, and the ore carries both gold and silver. There is a 5-stamp steam-power mill in connection with the claim. San Gabriel Mill and Mining Co., owners; Charles Kellogg, of Azusa, superintendent.

*Mammoth Mine* (Quartz).—It is 3 miles N.W. of Acton. Assessment work only. S. B. Savage, of Acton, owner.

*Monte Cristo Mines* (Quartz).—They comprise the *Dos Robles*, *Mikado*, *Monte Carlo*, and *Monte Cristo*, and are in Tajungo District, 16 miles E. of Acton, at approximately 4,700′ altitude. The developments consist of five tunnels, 5′ to 30′ long, and three shafts, 10′ to 40′ deep. The rock is crushed in a 4-stamp mill, with 600-lb. stamps, and a 5′ Huntington mill. Two of these mines yield free-milling ores and two of them sulphuretted ores. Five men are employed, principally on development work. R. E. Hudson et al., of Acton, owners.

*Pacific Beach Mining and Dredging Co.*—This company has been organized in Los Angeles to work, by amalgamation, auriferous sand on the seashore near Ballona, 4½ miles S. of Santa Monica. It is said that more than one hundred shafts, 5′ to 20′ in depth, have been sunk, proving the beach to consist of strata of gray sand, 3″ to 6″ in thickness, and black sand 2″ to 2′ in thickness. It is claimed that both the gray and the black sand are auriferous. H. F. Parker, of Los Angeles, secretary.

*Peabody & West's Mines* (Quartz).—They are on Mount Gleason, about 8 miles from Acton, and comprise the *Gold Ribbon*, *King of Gleason*, *Silent Friend*, and *White Cloud* claims. Assessment work only. Peabody & West, of Acton, owners.

*Red Rover Mine* (Quartz).—See our XIIth Report, p. 153. It is 3 miles N.W. from Acton, at approximately 3,310′ altitude. There is a 250′ tunnel and a 535′ incline. The plant consists of a steam hoist and a 10-stamp steam-power mill. Seventeen men are employed. H. T. Gage & Co., of Los Angeles, owners; Joseph Gilbert, of Acton, superintendent.

*Sierra Madre Silver Mining Co.'s Mine* (Quartz).—It is situated 5 miles N. of Azusa. It is worked through three tunnels, 200′ to 700′ in length, and two shafts, 50′ and 25′ deep. One small shipment of ore was made in 1895. Col. M. R. Vernon, of Los Angeles, president.

*Tajungo Group* of mines consists of the *Baltic*, *Boston*, *California*, *Los Angeles*, *Nevada*, and *Pacific*, and lie 16 miles E. of Acton, at about 4,700′ altitude. Developments consist of about 1,000′ of tunnels and

umerous shafts. Two men are employed on development work. Out-ut small. Hutchinson & Fuller, owners; E. H. Fuller, of Acton, uperintendent.

*Triumph Mine* (Quartz).—It is 6 miles N.W. of Acton. There is a 40′ tunnel and a 25′ shaft. Two men are employed on development ork. W. L. Hastings, of Acton, owner.

*Victoria Mine* (Quartz).—It is situated 5 miles N. of Azusa. The lant consists of a 10-stamp water-power mill. Victoria Mining Co., of ondon, England, owner; C. A. Sumner, of Broadway, Los Angeles, gent.

*Whitter Mine* (Quartz).—It is 3 miles N.W. of Acton. Assessment ork only. C. L. Wilson, of Acton, owner.

MILLS IN LOS ANGELES COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. |
|---|---|---|---|---|
| Kelsea | Steam | 5 | | |
| O'Rielly | Steam | 5 | 1,000 | 10 |
| Red Rover | Steam | 10 | 800 | |
| Victoria | Steam | 10 | | |

## Madera County.

This county, while possessing a number of gold mines of undoubted value, has suffered a severe reaction in its mining industry of late years by reason of ill-advised investment, or insufficient capital to complete necessary development or to furnish the proper equipment of machinery. Formerly large amounts of gold were shipped from mines in this county, at the time it was a portion of Fresno. The most famous of these were the Fresno Enterprise, on Potter Ridge; the Josephine and the Gambetta, at Grub Gulch; the Abby, near Hildreth; the Lily, near O'Neals, and numerous other less prominent mines. In looking over the county quite a number of promising prospects were found which apparently only require a reasonable amount of money and a practical knowledge of mining to place them on a paying basis. The greatest mineral industry at present is undoubtedly granite-quarrying near Raymond, described under head of "Structural Materials" in this Report. These quarries are reputed to be the finest in the world.

*Abby Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 202, 194, and 154. It is at Hildreth. Idle. George W. Grayson, of San Francisco, owner.

*Achsah D. Mine* (Placer).—It is in Fine Gold Gulch, 6 miles S. of Hildreth. C. B. Halstead, of Pollasky, owner.

*Albion Mine* (Quartz).—It is 2 miles E. of Gold Gulch. Only slightly developed. T. Keef et al., of Gold Gulch, owners.

*Alexandra Mine* (Quartz).—It is near Gold Gulch. Only superficially developed. L. Krohn, of Gold Gulch, owner.

*Alpha No. 2 Mine* (Quartz).—It is in Potter Ridge District, and has an 80′ incline. Waterloo Gold Mining Co., of San Francisco, owner.

*Alvarita Mine* (Quartz).—It is near Hildreth. Only superficial development of an 18″ vein. A. E. Snow et al., of Fresno, owners.

*Aurora Mine* (Quartz).—It is in Potter Ridge District. F. Dirks, of Gold Gulch, owner.

*Baltimore Mine* (Quartz).—See our XIIth Report, p. 154. It is on Jackass Mountain. Idle. Smith Norris, of Fresno, owner.

*Banderita Mine* (Quartz).—It is near Hildreth. D. Pray et al., of North Fork, owners.

*Bazinet Mine* (Quartz).—See Morrow.

*Beaumont Mine* (Quartz).—It is 1 mile S.E. of Grub Gulch, and has a 240′ tunnel on the vein. Charles M. Ward, of Grub Gulch, owner.

*Bellevue Mine* (Quartz).—See our XIIth Report, p. 154. It is 5 miles S.W. of Hildreth. Mr. Besone, of Gold Gulch, owner.

*Berry Mine* (Quartz).—See our XIIth Report, p. 154. It is near Hildreth, and has three shafts, 60′, 70′, and 140′ deep, on a vein in granite. L. V. Loomis et al., of Hildreth, lessees.

*Bessie H. Mine* (Quartz).—It is in Fine Gold Gulch, 5 miles S.W. of Hildreth. E. Wright, of Pollasky, owner.

*Blind Orphan Mine* (Quartz).—See our XIIth Report, p. 154. It is on Jackass Mountain. G. D. Hitchcock et al., of Madera, owners.

*Bowlder Mine* (Placer).—It is on Fine Gold Creek, in Sec. 26, T. 9 S., R. 21 E. J. M. Bowles, of Hildreth, owner.

*Buena Ventura Mine* (Quartz).—It is in Potter Ridge District. Theo. Strombeck, of Gold Gulch, owner.

*Bullion Mine* (Quartz).—It is at Grub Gulch. The vein dips W. in magnesian schists, which dip E. In width the vein is from 3″ to 18″, and is accompanied by a narrow sheet of intrusive rock. A tunnel has been driven 200′ on the vein. A number of surface cuts have been made on the vein, and a cross-cut tunnel has intersected it 50′ below the croppings; drifts have been run a short distance each way and a 20′ winze sunk. The long tunnel is now being driven forward to reach a point under the winze. C. M. Ward et al., of Grub Gulch, owners.

*Burney Mine* (Quartz).—See our XIIth Report, p. 154. It is in Potter Ridge District. There are three shafts, 70′, 100′, and 180′ deep. Idle. D. McLellan et al., of Gold Gulch, owners.

*Butterfly Mine* (Quartz).—See our XIIth Report, p. 155. It is ¾ mile W. of Savannah, and prospected by four tunnels 100′ above one another. The 14″ vein courses N. 50° W., and dips 50° N.E. A. W. Poole, of Grub Gulch, owner.

*Caledonia Mine* (Quartz).—It is a prospect in Potter Ridge District. D. McLellan et al., of Gold Gulch, owners.

*Caledonia Mine* (Quartz).—It is on the north end of Potter Ridge, 5 miles E. of Grub Gulch, and has been discovered and opened since our last Report. It is a 12″ wide fissure in amphibolite schist. A 120′ tunnel exposes high-grade quartz, which contains about 4% of sulphurets. Several other locations have been made on the fissure, but no work has been done on them. C. M. Ward et al., of Grub Gulch, owners.

*Canady Mine* (Quartz).—It is 6 miles S.W. of Hildreth, and has only superficial development. A. J. Canady, of Pollasky, owner.

*Caroline Mine* (Quartz).—It is on Swede Gulch, 2 miles N.E. of Gold Gulch. J. Jones et al., of Gold Gulch, owners.

*Central No. 2 Mine* (Quartz).—It is 2½ miles N.E. of Gold Gulch, on the North Fork of Deadwood Creek. D. McLellan et al., of Gold Gulch, owners.

*Chipmunk* (*Stargo*) *Mine* (Quartz).—It is 1 mile N.W. of Hildreth. D. L. Pray, of North Fork, owner.

*Cliff Mine* (Quartz).—See our XIIth Report, p. 155. It is on Jackass Mountain. Idle. P. Ralph, of North Fork, owner.

*Colorado Mine* (Quartz).—It is 2 miles E. of Gold Gulch. Only slightly developed. D. McLellan et al., of Gold Gulch, owners.

*Columbus Mine* (Quartz).—It is 5 miles E. of Gold Gulch. Morrison & Nimes, of Gold Gulch, owners.

*Combination Mine* (Placer).—It is on Fine Gold Creek, in Sec. 25, T. 9 S., R. 21 E. J. W. Stratham, of Hildreth, owner.

*Common Gold Mine* (Quartz).—It is 7 miles S.W. of Grub Gulch, on Spangle Gold Gulch, and has a shaft 140′ deep. Flooded. P. Reddy, of San Francisco, agent.

*Contention* (*Rough and Ready*) *Mine* (Quartz).—See our XIIth Report, p. 155. It is at Hildreth. T. Keefe et al., of O'Neals, owners.

*County View Mine* (Quartz).—See our VIIIth Report, p. 213. D. McLellan, of Gold Gulch, owner.

*Crab Tree Mine* (Quartz).—It is a prospect on the North Fork of Fine Gold Creek. T. Jones, of Gold Gulch, owner.

*Cross and Crescent Mines* (Quartz).—These are near Gold Gulch, and have only superficial development. G. Conkin et al., of Gold Gulch, owners.

*Crystal Spring Mine* (Quartz).—See our VIIIth Report, p. 214. It is 2½ miles N.E. of Grub Gulch. It consists of the following locations: *Crystal Springs*, *Investigation*, *Red Rover*, and *Southwestern*. The vein, about 2′ wide, courses N.E. and S.W., and dips 50° E., in slate. Idle. Chas. Knox, of Oakland, owner.

*Dagmar Mine* (Quartz).—It is in Potter Ridge District. C. Petersen et al., of Gold Gulch, owners.

*Daniels Mine* (Quartz).—It is at Hildreth. Developed superficially. E. R. Daniels et al., of Pollasky, owners.

*Defiance Mine* (Placer).—It is at the "old adobe crossing" of the San Joaquin River. J. Petersen, of North Fork, owner.

*Diana Mine* (Quartz).—See our XIIth Report, p. 156. W. R. Hampton, of Pollasky, owner.

*Eighty-four Mine* (Quartz).—It is in Potter Ridge District. D. R. McKenzie et al., owners.

*Eighty-six Mine* (Quartz).—It is 3 miles W. of O'Neals. The property comprises a group of eight claims. With the exception of the *Eighty-six* and *Lucky Boy* claims, they have only superficial development. The Eighty-six claim has an incline, 150′ deep, and several smaller shafts and open cuts, on each of two veins which cross near the main shaft. A steam hoist is being set up at this shaft, and mining operations are to be resumed. The Lucky Boy claim has a 50′ shaft. J. C. Beck et al., of O'Neals, owners.

*Eliza Jane Mine* (Quartz).—See our XIIth Report, p. 156. It is 1 mile E. of Hildreth, and opened by an 80′ incline and five tunnels of various lengths. Idle. P. Bazinet, of Hildreth, owner.

*Empire Mines*, *Nos. 1*, *2*, *and 3* (Quartz).—These are 3 miles S.W. of Grub Gulch, on a narrow but rich vein in granite. The developments consist of a 50′ tunnel and two shafts, 80′ and 130′ deep, respectively. The quartz is worked in arrastras. Lovely Bros., of Grub Gulch, owners.

*Europa Mine* (Quartz).—It is 3½ miles S.W. of Grub Gulch, on the Empire vein, and has a 180′ incline. G. Pendola, of Grub Gulch, owner.

*Fine Gold Mine* (Quartz).—It is 3½ miles N.E. of O'Neals. Mark Anderson, of O'Neals, owner.

*Fine Gold Mine* (Placer).—It is near Hildreth. J. Kirby, of Hildreth, owner.

*First Venture Mines* (Quartz and Placer).—They are 2 miles W. of Hildreth. J. L. Baker, of O'Neals, owner.

*Five Oaks Mines* (Quartz).—See our XIIth Report, p. 156. This group consists of *Alpha No. 1*, *Eclipse*, and *Sydney*, in the Potter Ridge District. Prospected by two tunnels, 170′ and 400′ long, and two shafts, 70′ and 40′ deep. The 25′ vein dips 35° N.E. Five Oaks Mining Co., of San Francisco, owner.

*Flying Dutchman Mines* (Quartz).—This property is 2 miles N.W. of Gold Gulch, and comprises six claims on one fissure or zone. Surface cuts and shafts have proven the vein at a number of points; the deepest inclines being 60′, 100′, and 150′, respectively. The vein, consisting almost wholly of quartz, is much crushed, but, as far as observed, not dislocated. The quartz carries iron sulphurets. There is no machinery on the property, but it is currently reported that the mines are to pass into other hands, and extensive development commenced at once. Mrs. L. Krohn, of Gold Gulch, owner.

*Fresno Banner Mine* (Quartz).—It is near Hildreth. J. Donohue et al., of Fresno, owners.

*Fresno Enterprise Mine* (Quartz).—See our XIIth Report, p. 156. It is 5 miles E. of Grub Gulch. Idle. J. Coats, of Pasadena, Los Angeles County, owner.

*Gambetta* (*Arkansas Traveler*) *Mines* (Quartz).—See our Xth Report, p. 197. It is 14 miles S. of Raymond, in Potter Ridge District, at 2,150′ elevation. This mine was reopened in the fall of 1895, after an idleness of several years. The vein is small, but the quartz is high-grade. The mine has a steam hoist and Huntington mill. Murray & Mills, of Grub Gulch, owners.

*Grand Central Mine* (Quartz).—It is 2 miles N.E. of Gold Gulch, and is a prospect only. D. McLellan et al., of Gold Gulch, owners.

*Greaser Gulch Mine* (Quartz).—It is on Greaser Gulch, 2½ miles N.E. of Gold Gulch, and has a small vein of rich quartz, which is crushed in an arrastra. J. S. Lingo, of Gold Gulch, owner.

*Great Eastern Mine* (Quartz).—It is near Gold Gulch. D. McLellan et al., of Gold Gulch, owners.

*Hall Mine* (Placer).—It is on the North Fork of the San Joaquin River. W. Hall, of North Fork, owner.

*Hallangshead Mine* (Quartz).—It is 9 miles E. of Pollasky, near the San Joaquin River. The vein, 4″ to 2′ in width, strikes N.E. and dips 30° N.W. A 130′ incline has been sunk on the vein. The formation is granite. E. Hallangshead, of Pollasky, owner.

*Hanover Mine* (Quartz).—See our VIIIth Report, p. 204. A new tunnel has recently been run to cut the vein. It has a steam hoist and 5-stamp mill. H. S. Williams, of Madera, owner.

*Harrietta Mine* (Quartz).—See our XIIth Report, p. 157. It is on Swede Gulch, 2 miles N.E. of Gold Gulch. D. McLellan et al., of Gold Gulch, owners.

*Hawkeye Mines* (Quartz).—They are 2 miles N.E. of Gold Gulch, and comprise a group of six claims. There is a tunnel, 250′ long, on the Hawkeye claim. The other claims have shallow shafts, cuts, etc.

When in active operation the quartz from these claims is hauled in wagons to the company's 5-stamp mill, on Deadwood Gulch. Hawkeye Mining Co., of Gold Gulch, owner.

*Henrietta Mine* (Quartz).—See our XIIth Report, p. 157. It is in Sec. 14, T. 10 S., R. 21 E., and on Fine Gold Creek. It is exploited by short tunnels and shallow shafts. J. A. Harris et al., of Pollasky, owners.

*Hesper Mine* (Placer).—It is near Hildreth. J. P. Newman, of Hildreth, owner.

*Hildreth (Volcano No. 2) Mine* (Quartz).—It is at Hildreth. The vein occurs in hornblende schist, and lies quite flat. The shafts, 200′ and 400′ deep respectively, have been sunk on the vein, and considerable surface work and stoping done. It is now idle. Estate of William Dunphy, of San Francisco, owner.

*Hoboken Mines* (Quartz).—See our XIIth Report, p. 158. They comprise the *Collector*, *Hoboken*, and *Treasurer* claims, and lie in Potter Ridge District. L. Krohn, of Gold Gulch, owner.

*Homestake Mine* (Quartz).—See our XIIth Report, p. 158. It is near Hildreth. The vein, 2′ to 6′ wide, dips 45° N.W. in granite. Developed by two inclines, 115′ and 160′ deep, and drifts therefrom. Wise & Brennan, of Hildreth, owners.

*Hughes Mine* (Quartz).—It is at Hildreth, and is partially developed. Idle. R. Williams, of Hildreth, owner.

*Indian Peak Mine* (Quartz).—See Mammoth.

*Jeff Davis Mine* (Quartz).—It is a prospect at Grub Gulch. C. Knox, of Oakland, owner.

*Josephine Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 213 and 202. It is in Grub Gulch, at 2,000′ elevation. Exploited by several inclines. From the 550′ shaft, the deepest, eight levels were driven. Formerly supplied with steam hoist, Cornish pump, and 20-stamp mill. Idle. Risdon Iron Works, of San Francisco, owner.

*Keefe Mine* (Quartz).—It is a prospect on Deadwood Gulch, near Gold Gulch. T. Keefe, of Gold Gulch, owner.

*Keno Mine* (Quartz).—See our XIIth Report, p. 159. It is in Potter Ridge District. M. A. Kipperdam, of Gold Gulch, owner.

*Lady Tad Mine* (Quartz).—It is on Greaser Gulch, 2½ miles N.E. of Coarse Gold, and has a narrow vein of rich quartz, in mica schist. The quartz from this claim and the Greaser Gulch claim, which joins it, is crushed in arrastras. J. S. Lingo, of Gold Gulch, owner.

*Last Chance Mine* (Placer).—It is at the "old adobe crossing" of the San Joaquin River. J. F. Hutchinson, of North Fork, owner.

*Last Chance Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 211, 201, and 159. It is 3 miles W. of Gold Gulch, and has two tunnels, each 700′ long. The 3′ vein courses N.E. and S.W., and dips 35° S.E., in slate. Supplied with a 10-stamp steam-power mill, 2 miles from the mine. Idle. D. R. McKenzie et al., of O'Neals, owners.

*Last Chance Mine* (Quartz).—It is 5 miles W. of Hildreth, and is a prospect. C. Williams, of Hildreth, owner.

*Laura May Mine* (Quartz).—It is a prospect, 2 miles E. of Gold Gulch, and has a vein 12″ to 18″ wide. D. McLellan et al., of Gold Gulch, owners.

*Lawsuit Mine* (Quartz).—It is 2 miles E. of Hildreth, adjoining the Morrow Mine. P. Bazinet, of Hildreth, owner.

*Lillie Mine* (Quartz).—See our XIIth Report, p. 159. It is 2 miles E. of O'Neals, and is worked to 100′ in depth, but is now idle. McDonald Bros., of Sonora, Tuolumne County, owners.

*Lingo Mine* (Quartz).—It is on Swede Gulch, 2 miles N.E. of Gold Gulch, and has three tunnels, 80′, 130′, and 200′ long, respectively. In this mine is found a zone of foliated, quartzose mica schist bearing gold. The zone is 35′ wide, all of which is claimed to carry gold. J. S. Lingo, of Gold Gulch, owner.

*Little Willie Mine* (Quartz).—It is in Fine Gold Gulch, and is a prospect. G. P. Gunter, of Pollasky, owner.

*Little Wonder Mine* (Quartz).—See our XIIth Report, p. 159. It is in Fine Gold Gulch. D. McLellan, of Gold Gulch, owner.

*Lottie K. Mine* (Quartz).—See our XIIth Report, p. 159. It is 5 miles S. of Hildreth. J. A. Harris et al., of Pollasky, owners.

*Lucky Bill Mine* (Quartz).—It is on the east side of Potter Ridge, 6 miles S.E. of Grub Gulch. It has a tunnel 230′ long, with an upraise of 100′ to the surface. Considerable stoping has been done. A water-power arrastra is being built ½ mile from the mine. The quartz is granular, glassy, and bunchy, resembling the Fresno Enterprise, a mile to the northward, and, like the latter, pays well. The country rock is mica schist, which also frequently carries gold in paying quantities in this vein-like zone. John Morrison et al., of Grub Gulch, owners.

*Lucky Boy Mine* (Quartz).—See Eighty-six.

*Lucky Dog Mine* (Quartz).—A prospect in Greaser Gulch, 2 miles N.E. of Gold Gulch. T. Kipperdam, of Gold Gulch, owner.

*Lucky Star Mine* (Quartz).—It is near Hildreth. R. Stayton et al., of O'Neals, owners.

*Mabel Mine* (Quartz).—It is in Hildreth District. W. F. Roddick, of Fresno, owner.

*Madera Mine* (Quartz).—See our XIIth Report, p. 160. It is in Fresno Mining District, and has a 90′ incline on a 4′ vein. A. Cadoza et al., of O'Neals, owners.

*Mammoth Mine* (Quartz).—See our XIIth Report, p. 160. It is at Grub Gulch, and includes the *Indian Peak* claim, which is undeveloped. Since our last Report the shaft has been sunk to a depth of 360′, and levels run at the 100′, 200′, and 300′ stations, together with numerous cross-cuts; besides, considerable stoping has deen done. The cross-cuts on the 200′ and 300′ levels developed an unexpected feature of the geology of the region. In the foot-wall is a large mass, size undetermined, of crystalline limestone or marble, which does not appear upon the surface at any point in the vicinity; it is probably a portion of the regular formation, and not a deposit. The hanging-wall, at the greatest depth reached, is still mica schist, as above. At a depth of 300′ a floor or slip was encountered, though the amount of displacement was very small. Nevertheless, it seems to have had a direct influence upon the deposition of gold in the vein-like zone, which is a silicious schist. For a distance of 20′ or more above the floor the quartz was very rich, gold being seen frequently, but below it the gold disappeared almost entirely. During 1894 a 10-stamp mill was built on this mine, and a hoisting works erected over the shaft. This machinery was operated by electricity, generated 1¼ miles distant on Fresno River. The entire property

as been shut down, with little promise of resumption. W. D. Pearon, of London, owner; Arthur Thomas, of Grub Gulch, agent.

*Manzanita Mine* (Quartz).—It is near Hildreth. Idle. R. P. Brownell, of Hildreth, owner.

*Marguerite Mine* (Quartz).—See our XIIth Report, p. 160. It is near Fine Gold. Charles Baker et al., of O'Neals, owners.

*Mayflower Mine* (Quartz).—It is 6 miles N.E. of Hildreth, near Fine Gold.

*Miller's Mine* (Quartz).—It is 6 miles S.W. of Hildreth, and has only superficial development. H. L. Miller et al., of Pollasky, owners.

*Minneapolis Mine* (Quartz).—See Savannah.

*Mint Mine* (Quartz).—It is a prospect in Swede Gulch, 2 miles N.E. of Gold Gulch. C. Peterson et al., of Gold Gulch, owners.

*Monitor Mine* (Quartz).—It is in Cabin Gulch, 1½ miles N. of Gold Gulch, and has only superficial workings. C. Peterson et al., of Gold Gulch, owners.

*Morning Star Mine* (Quartz).—See our XIIth Report, p. 161. It is 1½ miles E. of Gold Gulch. J. Hitchcock, of Alameda, owner.

*Morrow* (*Bazinet*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 195 and 154. It is 2 miles E. of Hildreth, at 1,650′ elevation. The vein courses E. and W. and dips 30° to 40° N., and varies from a thin seam to 18″ in width. There are several inclines, the deepest being 270′ in depth, besides drifts, stopes, etc. The quartz is crushed in arrastras. P. Bazinet, of Hildreth, owner.

*Mountain Lily Mine* (Quartz).—It is a prospect, 3 miles N. of Gold Gulch. D. McLellan, of Gold Gulch, owner.

*Mountain View Mine* (Quartz).—See our Xth Report, p. 198. It is 5 miles S. of Gold Gulch. Idle. J. Donohue, of Fresno, owner.

*Mud Springs* (*Wilson*) *Mine* (Quartz).—It is at Hildreth, and has a 300′ shaft on an 18″ vein. Idle. S. H. Williams, of O'Neals, owner.

*Muhly Mine* (Placer).—It is on the North Fork of San Joaquin River. T. Muhly, of North Fork, owner.

*Nellie Gray Mine* (Quartz).—See our XIIth Report, p. 161. It is 2 miles N. of Hildreth, and is a small, rich vein. J. H. Oester, of O'Neals, owner.

*Neversweat Mine* (Placer).—It is in Fine Gold Gulch. J. A. Harris, of Pollasky, owner.

*New Citizen Mine* (Quartz).—See our XIIth Report, p. 161. It is on Deadwood Gulch, 1½ miles N.E. of Gold Gulch. C. A. Lee et al., of Gold Gulch, owners.

*North Lillie Mine* (Quartz).—It is 2 miles E. of O'Neals, and is an extension of the Lillie. F. Wetmore, of O'Neals, owner.

*Old Joe Mine* (Quartz).—See Savannah.

*Overlooked Mine* (Quartz).—It is 1 mile S.E. of Hildreth. J. H. Morris, of Hildreth, owner.

*Owl Mine* (Quartz).—See our XIIth Report, p. 161. It is on Jackass Mountain. G. D. Hitchcock, of Madera, owner.

*Paymaster Mine* (Quartz).—See our XIIth Report, p. 161. It is 4 miles S.E. of Gold Gulch. It has a 900′ tunnel and a 10-stamp mill. Idle. Waterloo Gold Mining Co., of San Francisco, owner.

*Paterson Mine* (Quartz).—It adjoins the Mud Springs Mine, near Hildreth. J. Keating, of O'Neals, owner.

*Petersen Mine* (Quartz).—See Savannah.

*Pine Grove Mine* (Quartz).—See our XIIth Report, p. 162. It is 15 miles N.E. of Hildreth. James Lawson, of North Fork, owner.

*Pine Island Mine* (Quartz).—It is a prospect ½ mile below the mouth of Coarse Gold Gulch, on the north side of Fresno River. W. Downey et al., of Raymond, owners.

*Plain View Mine* (Quartz).—It is a prospect near Gold Gulch. F. Mellow et al., of Gold Gulch, owners.

*Pray Mine* (Quartz).—See our XIIth Report, p. 162. It is near Fine Gold Gulch. D. L. Pray, of O'Neals, owner.

*Prospect Mine* (Quartz).—It is a prospect in Swede Gulch. C. Petersen et al., of Gold Gulch, owners.

*Prospect Mine* (Placer).—It is at Hildreth. C. Petersen et al., of Gold Gulch, owners.

*Providence Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 206 and 162. It is 1½ miles N.E. of Gold Gulch. The 2′ vein courses N.W. and S.E., and dips 28° N.E., in granite. Opened by a 200′ incline and 500′ tunnel, partly caved. D. McLellan, of Gold Gulch, owner.

*Quartz Mountain* (*Min d'Or de Quartz Mountain*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 210 and 162. The vein, from a seam to 10′ in thickness, occurs in granite, which near the fissure has a schistose structure. The upper portion of the vein lies upon or very near the surface, the granite of the hanging-wall having been removed by erosion. The dip varies from 10° to 40° E., but is usually about 25°. The main incline is 250′ deep. There is an old 60-stamp steam-power mill and hoist on the property. Idle. J. H. Perry, of Gold Gulch, agent.

*Reba Mine* (Quartz).—It is a prospect at Grub Gulch, on an east and west vein crossing the Arkansas Traveler vein. Charles Knox, of Oakland, owner.

*Round Tree Mine* (Quartz).—It is a prospect 3 miles S.E. of Hildreth. E. D. Topping, of Hildreth, owner.

*Riverside and Starlight Mines* (Quartz).—See our XIIth Report, p. 162. These mines are ½ mile S.E. of Grub Gulch, and are operated as a single mine. Since our last Report this property has been developed by a 340′ incline on the vein, and levels run at the 100′, 200′, and 300′ stations. These developments expose large quantities of gold-bearing quartz, the vein ranging from 4′ to 15′ wide. Charles M. Ward et al., of Grub Gulch, owners.

*Runaway Mine* (Quartz).—It is 2 miles E. of Hildreth, and has a 100′ incline. The quartz is worked in arrastras. R. Williams et al., of Hildreth, owners.

*San Joaquin Mine* (Quartz).—See our XIIth Report, p. 163. It is 5 miles S. of Hildreth. J. A. Harris et al., of Pollasky, owners.

*San Joaquin Mine* (Quartz).—It is 5 miles S.E. of Hildreth, and has several hundred feet of tunnels and upraises. George Sym, of Hildreth, owner.

*Savannah Mines* (Quartz).—See our XIIth Report, p. 163. This property is situated from 1 to 2 miles S.E. of Grub Gulch, and comprises the following five claims, viz.: the *Minneapolis*, with a 150′ tunnel on the vein; *Savannah*, developed by two shafts, 150′ and 230′ deep respectively, and two cross-cut tunnels; *Wide Awake*, with superficial development; *Old Joe*, developed by a 250′ shaft, and a 60′ air shaft and a 100′ connecting cross-cut tunnel between them (see our XIIth Report, p. 158);

and the *Petersen*, which has only superficial development. Since our last Report the 10-stamp mill has been completed, and a water-power hoist erected over the main shaft of the Savannah. A 2,300′ tramway has also been built from the Old Joe Mine to the foot of hill in French Gulch, where ore-bins have been constructed, from which the quartz will be hauled by wagon to the mill. Louis H. Sharp, of San Francisco, owner; Charles W. Haskell, of Grub Gulch, superintendent.

*S. E. Canady Mine* (Quartz).—It is 6 miles S.E. of Hildreth, and has only superficial development. S. E. Canady et al., of Pollasky, owners.

*Seneca Mine* (Placer).—It is 5 miles E. of Hildreth. S. May, of Pollasky, owner.

*Sequin Mine* (Quartz).—See our XIIth Report, p. 163. A prospect. D. McLellan et al., of Gold Gulch, owners.

*Smultz Mine* (Quartz).—See our XIIth Report, p. 163. It is near Hildreth, and has an 80′ tunnel and a 40′ incline. Smultz Bros., of Fresno, owners.

*Snow Flake Mine* (Quartz).—See our XIIth Report, p. 163. It has a 375′ tunnel. Smith Norris, of Fresno, owner.

*Solferino Mine* (Quartz).—It is 4½ miles S.W. of Grub Gulch, on a small vein in granite. It has an 80′ incline. Louis Daello, of Stockton, owner.

*Standard Mine* (Quartz).—See our XIIth Report, p. 163. It is 2 miles N. of Hildreth, and has a 35′ tunnel and a 135′ shaft. G. W. Keller et al., of O'Neals, owners.

*Standard No. 2 Mine* (Quartz).—It is 2 miles N.E. of Gold Gulch, and has a 60′ tunnel and several surface cuts. D. McLellan, of Gold Gulch, owner.

*Starbuck Mine* (Quartz).—See our XIIth Report, p. 164. It is near Fine Gold, and has a 40′ tunnel. Mark Anderson, of O'Neals, owner.

*Starlight Mine* (Quartz).—See Riverside and Starlight.

*Stemwinder Mine* (Quartz).—See our XIIth Report, p. 164. It is on Jackass Mountain. Smith Norris, of Fresno, owner.

*Sunol Mine* (Quartz).—See our XIIth Report, p. 164. It is 2½ miles N.W. of Gold Gulch. There is a 100′ shaft on a 2′ ledge pitching 45° E. J. Krohn, of Gold Gulch, owner.

*Surprise* (*Old Jackass Brown*) *Mine* (Quartz).—See our XIIth Report, p. 164. It is on Jackass Mountain. There is a 40′ shaft and a 90′ tunnel, on a small vein dipping 60° N.E. B. Norris, of North Fork, owner.

*Swede Gulch Mine* (Quartz).—It is 1½ miles N.E. of Gold Gulch, and has superficial development on a vein 2′ to 5′ wide. Theodore Strombeck, of Gold Gulch, owner.

*Texas Flat Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 212 and 164. It is 1½ miles N.W. of Gold Gulch. It was formerly well developed by shafts and tunnels The 800′ tunnel has just been cleaned out and retimbered. J. B. Haggin et al., of New York, owners.

*Tiger Mine* (Quartz).—See our XIIth Report, p. 164. Idle. W. A. Poole, of Grub Gulch, owner.

*Triangle Mine* (Placer).—It is near North Fork. J. D. Jones, owner.

*Unmitigated Mine* (Quartz).—See our XIIth Report, p. 164. A 50′ shaft on an 8″ to 14″ vein. J. Morrison et al., of Gold Gulch, owners.

*Viana Mine* (Quartz).—It is near Hildreth, and has a 400′ tunnel. Idle. W. R. Hampton, of Pollasky, owner.

*Victoria Mine* (Quartz).—It is 6 miles N.E. of Grub Gulch, on Crooks Mountain. It is patented, and, after years of idleness, is to be reopened. Not now accessible. John Haley, of Ahwahnee, owner.

*Vienna Mine* (Quartz).—It is a prospect in Potter Ridge District. F. Dutchman, of Gold Gulch, owner.

*Volcano No. 1 Mine* (Quartz).—It is at Hildreth. The vein, 12″ to 15″ wide, lies nearly flat, cutting hornblende schist. It is worked by lessees, who crush the quartz in arrastras. It has several inclines, from 100′ to 130′ long. Charles O'Neals, of O'Neals, owner.

*Washington Mine* (Quartz).—See our XIIth Report, p. 164. A prospect, 2 miles N.E. of Gold Gulch. D. McLellan, of Gold Gulch, owner.

*Wide-awake Mine* (Quartz).—See Savannah.

*Williams Mine* (Quartz).—It is 2 miles E. of Hildreth, near the Morrow Mine. The vein is small, and the quartz is worked in arrastras. George and Reuben Williams, of Hildreth, owners.

*Willow Creek Mine* (Quartz).—It is 2½ miles S. of O'Neals. The vein can be traced on the surface for a distance of 1,500′, and is from 6″ to 4′ or more in width, carrying gold and auriferous sulphides. A shaft was recently sunk on the vein and a steam arrastra built, but, no provision being made to control the water in the mine, sinking was soon abandoned, and shortly afterward the work closed. The prospect is deserving of a more thorough trial, under competent management. Charles O'Neals, of O'Neals, owner.

*Zebra Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 210 and 199. Zebra Mining Co., of Gold Gulch, owner.

## MILLS IN MADERA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Abby | | 10 | 850 | | | | | | | |
| Fresno Enterprise | | 20 | 700 | (Machinery going to decay.) | | | | | | |
| Hanover | | 5 | 700 | 10 | | | | | | |
| Hawkeye | | 5 | 800 | | | | | | | |
| Mammoth | | 10 | 850 | 30 | | | | | | |
| Quartz Mountain | | 60 | 850 | | 6 | Frue | | | | |
| Savannah | | 10 | 850 | 30 | 4 | McGlew | | | | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MADERA COUNTY.

| Name of Mill or Mine. | Power. | Number | Character. | Diameter | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Cliff | | | Arrastra | | | | | | | | |
| Contention | | | Arrastra | | | | | | | | |
| Crystal Spring | | | Huntington | | 25 | | | | | | |
| Eliza Jane | | | Arrastra | | | | | | | | |
| Empire | | | Arrastra | | 1½ | | | | | | |
| Europa | Horse | | Arrastra | | 1 | | | | | | |
| Gambetta and Arkansas Traveler | | | Huntington | 3½′ | 8 | 2 | Triumph | | | | |
| Hildreth | | | Huntington | | | | | | | | |
| Lady Tad | | | Arrastra | | ½ | | | | | | |
| Lawsuit | | | Arrastra | | | | | | | | |
| Lucky Bill | Water | | Arrastra | | 1½ | | | | | | |
| Morrow | | | Arrastra | | | | | | | | |
| Pine Grove | | | Arrastra | | | | | | | | |
| Williams | | | Arrastra | | | | | | | | |
| Willow Creek | Steam | | Arrastra | | 3 | | | | | | |

## Mariposa County.

As prophesied in our last Report, this county has experienced a decided impetus in the mining industry. The reopening of the mines on the Cook Estate, near Coulterville, has not only given employment to a large number of men and infused new life into the community, but it has stimulated activities all over the county. The machinery placed upon the mines at Coulterville is of the finest and most expensive description. On the "East Lode" there is active prospecting, and attention is being attracted to these mines, many of which are high grade, and would pay handsomely if provided with better facilities. On the Mariposa Estate, whose boundaries are clearly outlined on the "Mother Lode Map," recently issued by the Bureau, considerable prospecting has been done, under the supervision of the agent, and several promising veins have been discovered. But the mines on this last property are still idle.

*Adelaide Mine* (Quartz).—See Crown Lead.

*Alabama Mine* (Quartz).—See Whitlock.

*Anderson Mine* (Quartz).—See Crown Lead.

*Banderita Mine* (Quartz).—See our XIIth Report, p. 167. It is 10 miles E. of Coulterville. Idle. C. L. Mast, of Coulterville, agent.

*Barley Field Mine* (Quartz).—It is a pocket mine, in granite, 4½ miles N.E. of Mariposa. Joseph Laundrum, of Mariposa, owner.

*Barrett Mine* (Quartz).—It is 7 miles N.E. of Mariposa, near Bear Creek, and is a new prospect. J. W. Stetson et al., owners.

*Barrett Mine* (Quartz).—It is 6 miles N.W. of Bear Valley, in Hunters Valley. It is a prospect. Joseph Barrett, of Hornitos, owner.

*Black Bart Mine* (Quartz).—See our XIIth Report, p. 168. It is a pocket mine, 11 miles E. of Coulterville. S. B. Sample, of Coulterville, owner.

*Black Hill Mine* (Quartz).—It is 1 mile N.W. of Coulterville. A 600′ tunnel has been driven on it. Clark & McLaymont, of Coulterville, owners.

*Bondurant* (*Hathway*) *Mine* (Quartz).—See our VIIIth Report, p. 347. It is on the "East Lode," 11 miles N.E. of Coulterville, at 2,860′ elevation. The 30″ vein courses E. and W., and dips 38° N. Idle. Bondurant Gold Mining Co., of St. Louis, Mo., owner; C. F. Bruner, of Coulterville, superintendent.

*Buena Vista Mine* (Quartz).—It is a prospect, 3 miles S.E. of Coulterville. Two men are employed. Angelo Gabarina, of Coulterville, owner.

*Bull Pup and Bull Dog Mines* (Quartz).—They are near the Whitlock, 6 miles N. of Mariposa. J. Helm & Son, of Mariposa, owners.

*Cabinet Mine* (Quartz).—It is 2½ miles S.W. of Coulterville, near Horseshoe Bend. There are two veins in this claim, which intersect at an angle of 45°. One of them strikes N.W., and carries gold; the other strikes E., and contains both gold and cinnabar. The latter vein, 8″ to 3′ wide, has formed in a dike cutting the diabase. C. L. Mast, of Coulterville, owner.

*Campodonica Mine* (Quartz).—It is 1 mile E. of Hornitos. Idle. Campodonica Mining Co., of Hornitos, owner.

*Champion Mine* (Quartz).—Fully described in our Xth Report, p. 302. It is in granite, 4½ miles N.E. of Mariposa. Idle. James Ridgeway, of Mariposa, owner.

*Cherokee Mine* (Quartz).—It is 9 miles E. of Coulterville, and has developments on two veins, which are 30′ apart. A tunnel has been driven 600′ on the larger vein. J. Shimer, of Coulterville, owner.

*Comet Mine* (Quartz).—It is 12 miles E. of Mariposa, near Schneider's mill. There is a 60′ shaft on the vein, and two tunnels, each over 300′ long. The vein is from a few inches to 4′ in width. Idle. Dan Heaton, of Jerseydale, owner.

*Compromise* (*Marble Spring*) *Mine* (Quartz).—It is 13 miles E. of Coulterville, and is being worked in a small way after a long idleness. M. Hilliard, of Coulterville, owner.

*Congo Mine* (Quartz).—See our XIIth Report, p. 168. It is 3 miles E. of Coulterville. A cross-cut tunnel, 250′ long, intersects a shaft at the vein. The vein is large, and, besides gold, carries iron and copper sulphurets. J. Mentzer, of Coulterville, owner.

*Cranberry Mine* (Quartz).—See our VIIIth Report, p. 348. It is 25 miles E. of Mariposa, on the Middle Fork of Merced River, at 2,550′ elevation. The vein courses N.W. and S.E., and dips 40° N. A 700′ tunnel has been driven on the vein; 600′ from the mouth, it connects with a 200′ shaft. The pay-shoot is 4′ wide. A. H. Ward, of Alameda, owner.

*Crown Lead Mines* (Quartz).—This property is S.W. of Coulterville, and comprises a large group of claims extending 16,000′ along the lead. The southern end of the property is the *Crown Peak* claim, near Split Rock Ferry, from which the lead extends in a northerly direction to within 2½ miles of Coulterville. The *Crown Peak* (patented) is 1,166′ long, and developed by a 45′ shaft on an 8′ vein. The *Robert Emmet* (patented) is 1,500′ long, superficial development. The *Crown Lead* (patented) is 5,584′ long, and has a 50′ shaft and a 75′ tunnel. The *Crown Lead No. 2* is 1,500′ long, and has a 30′ shaft. The *Occidental* is 1,500′ long, with superficial development. The *Anderson* (patented) is 2,000′ long (see our Xth Report, p. 38), and the vein is 4′ to 12′ wide. It has three tunnels, 170′, 175′, and 350′ long, respectively. This claim lies to the eastward of the main line of claims, on a branch vein. The *Adelaide* (patented) is 2,750′ long (see our Xth Report, p. 38), and the vein is 8′ to 10′ wide. There are tunnels and a 90′ shaft. The *Midas* (patented) is 2,000′ long, and the 45′ shaft exposes a 6′ vein. Most of the development on this property was done about twenty-five years ago, when an extensive system of roads was also built. These mines are on the west branch of the "Gold Belt," which leaves the main fissure at the *Pine Tree* and *Josephine* mines and unites with it again near *Piñon Blanco*, 3 miles N.W. of Coulterville. All the veins are similar geologically, being banded, branching, and building up by frequent overlapping or "splicing" of sheets of quartz. Dike rocks are commonly present, sometimes on one wall, and as often on both. The fissures cut alike through slates and diabase. Idle. Robert E. McSherry and the McCrellish Estate, owners; W. B. McSherry, of Coulterville, superintendent.

*Crown Peak Mine* (Quartz).—See Crown Lead.

*Dahlia Mine* (Quartz).—See Merced Gold Mining Co.

*Dan Cook Mine* (Quartz).—See Merced Gold Mining Co.

*Dina Mines* (Quartz).—These are 7 miles N.E. of Mariposa, on Volcanic Hill, and comprise four claims. The gold-bearing zone is found in amphibolite schist, and contains 2% to 3% auriferous pyrite. Sheets of

quartz are also found in the schistose diabase. Ten men are employed W. H. Wright, of Mariposa, owner.

*Doss (Brooks) Mine* (Quartz).—It is 2 miles S. of Hornitos. A 110 shaft has been sunk on the vein, which near the bottom is heavily mineralized. The sulphurets are chiefly iron pyrite, galena, blende, and chalcopyrite. The mine has a steam hoist, and power drills are used in the shaft. Five men are employed. Estate of E. F. Brooks, of Hornitos, owner.

*Duncan Mine* (Quartz).—It is 1 mile S. of Hornitos. Idle. William and George Turner, of Hornitos, owners.

*Elizabeth Mine* (Quartz).—See Mariposa Mining and Commercial Co.

*Evans Mine* (Quartz).—See our XIIth Report, p. 169. See Mariposa Mining and Commercial Co.

*Farmers' Hope Mine* (Quartz).—See our Xth Report, p. 309. It is 6½ miles N. of Mariposa, near the Whitlock Mine. Ellingham & Gove, of Mariposa, owners.

*Ferguson Mine* (Quartz).—It is 23 miles N.E. of Mariposa. It has a large amount of development, but only assessment work has been done for several years past. William Sharwood, of Soulsbyville, Tuolumne County, owner.

*Filiciana Mine* (Quartz).—It is 10 miles N.E. of Mariposa, and is worked in a desultory manner. J. C. Campbell, of San Francisco, owner.

*Flyaway Group* (Quartz).—It is 7 miles S.E. of Coulterville, near the head of Flyaway Gulch, and comprises eight claims, none of which have much development. A 5-stamp mill has been used to prospect the several claims. W. M. Darling, of Oakland, agent.

*Frances Mine* (Quartz).—It is about 7 miles S.W. of Mariposa, on Mariposa Creek. There are two veins in the claim, 60′ apart. They are from 4′ to 8′ wide, and carry free gold and auriferous sulphurets. J. E. Towles, of Oakland, agent.

*Franklin Mine* (Quartz).—See Washington.

*Georgiana Mine* (Quartz).—It is on the Mariposa Estate, 2 miles N.E. of Bear Valley. The vein stands perpendicularly and strikes E., and is from 8″ to 18″ wide. The quartz is pure white, crystallized in part, and carries a small percentage of iron sulphurets, but is rich in gold. Two tunnels and some surface cuts have recently been made on the vein. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Green Gulch Mine* (Quartz).—It is ½ mile W. of Princeton, and on the "Mariposa Grant."

*Hasloe Mine* (Quartz).—It is on Gentry's Gulch, near the North Fork of Merced River. Idle. John Morgan, of San Francisco, owner.

*Hayseed Mine* (Quartz).—See our Xth Report, p. 308. It is 6½ miles N. of Mariposa, near the Whitlock. The 14″ vein courses N. 60° E., and dips 40° E., between slate and diabase. J. Helm & Son, of Mariposa, owners.

*Heiser and Peregoy Mine* (Quartz).—See our Xth Report, p. 308. It is 6½ miles N. of Mariposa, near the Whitlock, and has a 60′ shaft. The 8′ vein courses N. and S., and dips slightly E., in slate. Chas. H. Schlagerter et al., of Mariposa, owners.

*Hite Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 344 and 170. It is 23 miles E. of Mariposa, at 2,080′ elevation. The 8′ vein courses E. and W., and dips 75° N., in slate. Since our last Report

the dam has been rebuilt, a new flume constructed, and the surface plant rehabilitated. The mine has been pumped out, the old workings cleaned and in places retimbered, and mining operations resumed. The 20-stamp mill has been rebuilt, and 15 stamps are now running; the quartz being taken from the old levels, mostly below the adit level, but as yet no attempt has been made to sink the winze deeper or to prospect below the old levels. Thirty-eight men are employed. John R. Hite, of San Francisco, owner.

*Horseshoe Mine* (Quartz).—It is 10 miles E. of Coulterville, and has a 600′ tunnel on the vein. C. L. Mast, of Coulterville, owner.

*Horseshoe Mine* (Quartz).—It is in Hunters Valley, 3 miles W. of Bear Valley. It is equipped with a steam hoist and 5-stamp mill. The incline shaft is 105′ deep. Thirteen men are employed. The Horseshoe Mill, Power, and Mining Co., of Merced, owner.

*Jenny Lind Mine* (Quartz).—See Washington.

*Josephine Mine* (Quartz).—See our Xth and XIIth Reports, pp. 35 and 309, and 173–174. Since our last Report, old workings have been reopened, and show the existence of another large ore-shoot, 1,000′ N.W. of that previously described. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Juniper Mine* (Quartz).—See our XIIth Report, p. 171. It is 1½ miles W. of Bear Valley. Idle.

*Lacy* (*Talc*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 304 and 171. It is 7 miles N.E. of Mariposa, near Colorado. One man is employed. George Lacy, of Mariposa, owner.

*La Grippe Mine* (Quartz).—It is 8 miles E. of Coulterville, and has two shafts, 80′ and 50′ deep. Idle. P. P. Mast, owner; C. L. Mast, of Coulterville, superintendent.

*Lewis Mine* (Quartz).—It is on the Mariposa Estate, ½ mile N.W. of Princeton. It is a new discovery, and is presumed to be a northerly extension of the Princeton vein. It has been opened to a depth of 60′ by several shafts, which are connected by drifts. The vein is small, but rich. Three men are employed. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Lookout Mine* (Quartz).—It is 2½ miles S.W. of Coulterville. A tunnel has been driven 60′ on a 3′ vein. P. P. Mast, owner; C. L. Mast, of Coulterville, agent.

*Louisa Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 346 and 171. A vertical shaft is being sunk in the hanging-wall, which had reached a depth of 400′. Fifty men are employed. Merced Gold Mining Co., of Boston, Mass., owner; J. R. Gilbert, of Coulterville, superintendent.

*Louisiana Mine* (Quartz).—It is 9 miles E. of Coulterville, and has three shafts, 180,′ 100′, and 75′ deep, respectively; also several hundred feet of cross-cut tunnels, drifts, etc. The vein occurs in black slate, with a dike on the hanging-wall side. Idle. The hoists and mill were burned several years ago. J. T. Gove, of San Francisco, owner.

*Ludwig Mine* (Quartz).—It is ½ mile N.W. of Princeton, on the Mariposa Estate. It lies several hundred feet west of and nearly parallel to the Princeton vein. It has a large amount of superficial development, most of which was done many years ago. A tunnel has been driven on the vein recently. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Mahone Mine* (Quartz).—See our VIIIth Report, p. 347. It is 2 miles N.W. of Coulterville, at 1,700′ elevation. Merced Gold Mining Co., of Boston, Mass., owner.

*Malvina Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 347, 39, and 172. It is 1½ miles W. of Coulterville, on the West Lode. Since our last Report, this and the *Potosi*, adjoining it on the N.W., have been reopened. The old Potosi tunnel has been cleared of debris and a new vertical shaft sunk in the hanging-wall slates of the Malvina, which was said to be 500′ deep, and sinking was being continued. Fifty men are employed. Merced Gold Mining Co., of Boston, owner; J. R. Gilbert, of Coulterville, superintendent.

*Malvina No. 2 Mine* (Quartz).—It is 1¼ miles W. of Coulterville, joining the Malvina on the south. It has an incline 100′ deep. Merced Gold Mining Co., of Boston, Mass., owner.

*Manzanita Mine* (Quartz).—It is 13 miles E. of Coulterville, near Marble Spring. It is worked in a small way, the quartz being crushed in an arrastra. Two men are employed. M. Hilliard, of Coulterville, owner.

*Mariposa Mine* (Quartz).—It is in the town of Mariposa. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Mariposa Mining and Commercial Co.* is owner of the "Mariposa Estate" or "Grant"—a tract of 70 square miles. See "Mother Lode Map," recently issued by the Bureau, and our VIIIth, Xth, and XIIth Reports, pp. 343, 33–37, 309, and 172. The most important mines on the "Grant" are the *Pine Tree*, *Josephine*, *Princeton*, *Mariposa*, *Mount Ophir*, *Lewis*, *Georgiana*, *Ludwig*, and *Texas*. Besides these, there is a large number of other claims, in various stages of development. During the past two years considerable prospecting has been done on the "Grant," under the direction of John D. Ludwig. Ores from the various claims were mined, and hauled by wagon to a 5-stamp mill on Missouri Gulch and crushed. Five men are employed.

*Margaret Mine* (Quartz).—It is at Coulterville, and is undeveloped. Merced Gold Mining Co., of Boston, Mass., owner.

*Martin and Walling Mine* (Quartz).—It is 8 miles E. of Coulterville. Idle. C. L. Mast, of Coulterville, agent.

*Mary Harrison Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 346 and 41. It is 2 miles S.E. of Coulterville, at 1,700′ elevation. The vein, averaging 12′ in width, courses N.W. and S.E., and dips 50° easterly. The old workings, 600′ deep, have been reopened, and a new vertical shaft is being sunk north of the old incline. Twenty-five men are employed. Merced Gold Mining Co., of Boston, Mass., owner.

*Merced Gold Mining Company, of Boston.*—Thos. Couch, manager; J. R. Gilbert, of Coulterville, superintendent. Since our last Report, this company has purchased the large mining territory near Coulterville for years known as the "Cook Estate," and comprising about 20,000 acres. Within this area are thirteen claims, a portion of which are on the "Mother Lode," and others on the "West Lode." See our VIIIth, Xth, and XIIth Reports, pp. 346, 38, and 168. On the Mother Lode the claims south of Coulterville are the *Margaret*, *Louisa* (2 claims, 3,000′), *Ventura*, *Mary Harrison*, and *Dahlia*. On the "West Lode" the claims are the *Malvina*, *Malvina No. 2*, *Potosi*, *Dan Cook*, and *Mahone*. The *Midas* and *Sheridan* claims are on other veins. On the Louisa, Mary Harrison, Malvina, and Potosi, the old workings have been

cleaned out and retimbered, and three new vertical shafts are being sunk. Concerning the underground developments nothing can be authoritatively said, as admission to the mines and all information were positively refused. Of the surface improvements, it may be said there are none better on any mining property in California, and everything is being done on an elaborate scale. A 40-stamp mill is being built in the cañon of Black Creek, a short distance from the mouth of the Potosi tunnel, which will be run by water taken from the creek about ½ mile above. The superintendent stated that it was the intention to construct lines of railway from the several mines to the mill, where the ores would be crushed and tested from time to time, as the work of development proceeds.

*Mexican* (*El Carmen*) *Mine* (Quartz).—It is 25 miles E. of Mariposa. Two tunnels, 240′ and 380′ long, respectively, have been run on the vein. A shaft 120′ deep intersects the upper tunnel 100′ from the surface. The ore is high grade and has been ground in arrastras. Idle. A. H. Ward, of Alameda, owner.

*Mexican Mine* (Quartz).—It is 1 mile S.W. of Bear Valley. See Mariposa Commercial Co.

*Mexicans' Mine* (Quartz).—It is 1½ miles W. of Bear Valley, adjoining the Yellowstone. Worked by Mexicans, who crush the quartz in arrastras. Two men are at work.

*Midas Mine* (Quartz).—It is 2 miles S.W. of Coulterville. See Merced Mining Co.

*Midas Mine* (Quartz).—It is 2½ miles S.W. of Coulterville. See Crown Lead.

*Mount Gains Mine* (Quartz).—It is 5 miles N.E. of Hornitos, and has a 300′ shaft. Idle. Joseph Spagnoli, of Hornitos, owner.

*Mount Ophir Mine* (Quartz).—See Mariposa Mining and Commercial Co.

*Nevada Mine* (Quartz).—See our XIIth Report, p. 173. It is a pocket mine, 2 miles W. of Bear Valley. Two men are employed. Judge Hall, of Bear Valley, owner.

*No. 9 Mine* (Quartz).—See our XIIth Report, p. 173. It is 2½ miles W. of Hornitos. The vein is 4′ to 10′ wide, and is developed by shafts, 210′ and 440′ deep, respectively. It has a steam hoist and a 30-stamp mill. Idle. M. L. Rodgers, of Hornitos, owner.

*Occidental Mine* (Quartz).—It is 3½ miles S.W. of Coulterville. See Crown Lead.

*Pine Tree Mine* (Quartz).—See our Xth and XIIth Reports, pp. 35–309 and 173. It is 1¾ miles N. of Bear Valley, on the Mariposa Estate. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Piñon Blanco Mine* (Quartz).—See our Xth Report, p. 43. It is 3 miles N.W. of Coulterville, and consists of three claims, viz.: *Old Judge* (1,500′), *Piñon Blanco* (5,850′), and *North Piñon* (550′). The Old Judge has two tunnels, 25′ and 100′ long, respectively, besides several surface openings. In this mine is a shoot of white quartz, through which is disseminated, in small crystals, gray copper and iron sulphurets. It is said to be a good grade of milling rock. This shoot lies near the contact of gabbro with a large ankerite mass, in which mariposite is quite prominent. The Piñon Blanco claim has over 1,000′ of tunnels, drifts, and shafts. These developments show the ankerite mass to exceed 300′ in width. A massive vein of quartz, with a ribbon-like structure,

is found on the hanging-wall side, and some of this is rich in gold. The North Piñon Blanco claim is on the same hill as the last mentioned and is similar in every way to it. A 200′ tunnel has been driven on this claim. Four men are employed. A. H. Ward, of Alameda, owner.

*Potosi Mine* (Quartz).—See our Xth Report, p. 39. See Merced Gold Mining Co.

*Princeton Mine* (Quartz).—It is at Princeton. See Mariposa Mining and Commercial Co.

*Quail Mine* (Quartz).—It is 10 miles E. of Coulterville, and is usually worked during the season when water is abundant. F. Bruschi, of Coulterville, owner.

*Quartz Mountain Mine* (Quartz).—See our XIIth Report, p. 175. It is 2 miles S. of Hornitos. Idle. W. L. Rodgers, of Hornitos, owner.

*Red Cloud Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 345 and 175. It is 10 miles E. of Coulterville. Idle. Red Cloud Mining Co., of Boston, owner.

*Red Hill Mine* (Quartz).—See our Xth and XIIth Reports, pp. 41 and 175. It is 6½ miles S.E. of Coulterville. The vein occurs at contact of diabase and serpentine, and contains iron and copper sulphurets and free gold. Mrs. G. Cammissiona, of Coulterville, owner.

*Regan Mine* (Quartz).—It is 6 miles N. of Mariposa, near the Whitlock, and has an 80′ shaft. H. Austin et al., of Fresno, owner.

*Reliance Reduction Works.*—This enterprise is 2 miles S. of Hornitos, near the Quartz Mountain Mine, and was built to treat the custom concentrates from the mines of the district. The plant consists of a single reverberatory furnace and the necessary leaching and precipitating vats. Idle. Reliance Reduction Co., owner; W. H. Ham, of Hornitos, superintendent.

*Rising Sun Mine* (Quartz).—It is 1 mile W. of Bear Valley. It has been worked to a depth of 60′, but too much water stopped further sinking, there being no machinery on the mine. J. Dalcich et al., of Bear Valley, owners.

*River View Mine* (Quartz).—It is 6 miles N.W. of Hornitos, near Merced River. A 70′ shaft has been sunk on a vein 8′ to 10′ wide, which carries 3% sulphurets. There is also a 30′ tunnel. Henry Nelson, of Merced Falls, owner.

*Robert Emmet Mine* (Quartz).—See Crown Lead.

*Rollins Mine* (Quartz).—It is on Sweetwater Creek, 8 miles E. of Mariposa, and is an old mine being reopened. Two men are engaged in driving a tunnel. Revelle Bros., of Jerseydale, owners.

*Rutherford Mine* (Quartz).—It is 25 miles E. of Mariposa. Some years ago a tunnel was driven 340′ on the vein, which was then stoped to the surface, the quartz being ground in arrastras. It now requires machinery. There are only trails to the mine, the nearest wagon-road being that to the Hite Mine. A. H. Ward, of Alameda, owner.

*Santa Clara Mine* (Quartz).—It is 7 miles N.E. of Mariposa, adjoining the Santa Rosa on the north. It has a 60′ incline and a 100′ tunnel. Two men are employed. Stetson & Hart, of Mariposa, owners.

*Santa Rosa Mine* (Quartz).—It is 7 miles N.E. of Mariposa, on the west side of Bear Creek, and has come into prominence since our last Report. It was worked some time by C. D. Lane et al., with W. Garrard as superintendent, but was unsatisfactory, and closed down. It is

reported that part or all the purchase price was refunded. The mine is equipped with a 10-stamp steam-power mill and concentrators.

*Schroeder Mines* (Quartz).—They are on the Schroeder ranch, 9 miles N.E. of Mariposa. They consist of several pocket veins that are worked in a small way. John Schroeder, of Mariposa, owner.

*Sebastopol Mine* (Quartz).—See our Xth Report p. 305. It is 4 miles S.E. of Mariposa, at 2,850′ elevation. The vein courses N. and S. and dips vertically. Dismantled and abandoned. — Hart, of Mariposa, owner.

*Sheridan Mine* (Quartz).—See Merced Gold Mining Co.

*Sherlock Mine* (Quartz).—See our Xth Report, p. 306. It is 5½ miles N.E. of Mariposa. Idle.

*Sirocco Mine* (Quartz).—See Yellowstone.

*Spencer Mine* (Quartz).—It is 6½ miles N. of Mariposa. The vein is in diabase, and has a 100′ shaft, now caved. Near the north end of the claim a tunnel has been run in 480′ on the fissure, cutting two pay-shoots, 45′ and 55′ long, respectively. The face of the tunnel is 200′ below the surface. The vein averages 3′ wide. A. H. Ward, of Alameda, owner.

*Star Mine* (Quartz).—It is 11 miles E. of Coulterville, near North Fork of the Merced, and has a tunnel 250′ long. C. L. Mast, of Coulterville, agent.

*Stevenson Group* (Quartz).—It is on the north side of Merced River, at Redbanks, about midway between Benton Mills and Split Rock Ferry, and comprises five claims. Several cross-cut tunnels have been run at various points, and prospecting work is now in progress. Eight men are employed. A. Wartenweiler, of San Francisco, owner.

*St. Paul Mine* (Quartz).—It is a prospect, 3½ miles S.E. of Coulterville. Angelo Gabarino, of Coulterville, owner.

*Teets Mine* (Quartz).—It is 6 miles N. of Mariposa, and has a shaft 150′ deep. Two men are employed. Jacob Teets, of Mariposa, owner.

*Texas Gulch Mine* (Quartz).—It is on Texas Gulch, 1 mile S.W. of Princeton. Two 60′ shafts have recently been sunk on a 12″ vein of rich quartz. Mariposa Mining and Commercial Co., of San Francisco, owner.

*Thorn Mine* (Quartz).—It is 2 miles S. of Hornitos, near the Quartz Mountain Mine. Idle. Mrs. Hardwick, of Hornitos, owner.

*Triple Alliance Mine* (Quartz).—It is 2½ miles N.W. of Bear Valley, and is a new prospect in the diabase of Bear Mountain. Three men are employed. Robert Hutchinson et al., of Bear Valley, owners.

*Triumph Mine* (Quartz).—It is 6 miles N. of Mariposa, near the Whitlock. The shaft is 150′ deep. Two men are employed. J. Helm, of Mariposa, owner.

*Tyro Mine* (Quartz).—See our Xth and XIIth Reports, pp. 39 and 176. It is 1¼ miles S.W. of Coulterville. The main shaft is 700′ deep, with air connections to the old shaft. An 8″ Cornish pump has recently been added to the plant. The steam hoist and mill are both under one roof. Wood is delivered at the mine by pack train. Thirty men are employod. San Francisco Mining Co., owner; J. McLaughlin, of Coulterville, superintendent.

*Vanderbilt Mine* (Quartz).—See our XIIth Report, p. 176. It is on Buckingham Mountain, 8 miles E. of Mariposa, and lies in the mica schists, which extend S.E. to Potter Ridge District, Madera County. Since our last Report, considerable work has been done at this mine,

and a 10-stamp mill built on Snow Creek, ½ mile from the mine. The quartz is hauled in large cars from the mine to the mill. At present a number of men are engaged in overhauling the tramway and mill preparatory to resuming work. Sunset Mining Co., owner; George Beebe, of Darrah, superintendent.

*Ventura Mine* (Quartz).—See Merced Mining Co.

*Virginia (Coe) Mine* (Quartz).—See our Xth Report, p. 41. It is 4 miles S. of Coulterville. The property has for years been involved in litigation, which is understood now to have been settled, with a prospect of a resumption of operations. O'Toole & Arnold, of San Diego, owners.

*Washington Mines* (Quartz).—See our XIIth Report, p. 176. They consist of the *Washington*, *Franklin*, and *Jenny Lind*, and are 2½ miles N.E. of Hornitos. The Washington was formerly a large producer, and worked to a depth of 1,500′. M. L. Rodgers, of Hornitos, owner.

*Westminster Mine* (Quartz).—It is 5 miles N.W. of Hornitos, and is a new prospect, having a 25′ shaft on a vein 3′ to 4′ wide. Henry Nelson, of Merced Falls, owner.

*Whitlock and Alabama Mines* (Quartz).—See our XIIth Report, p. 176. They are 6 miles N. of Mariposa, and are located on parallel veins. The principal development is on the Whitlock vein. A cross-cut tunnel has been driven 600′ to the vein, along which a drift extends several hundred feet. There are also several surface openings and shorter cross-cut tunnels, and two shafts. The main shaft is now 480′ deep, and still being sunk. A fire occurred in the mine in the summer of 1895. The shaft timbers were completely burned out, and the fire, communicating with the hoisting works on the surface, destroyed them also; subsequently, heavy caves of wall-rock occurred in the shaft. This necessitated sinking the new shaft, and involved a great amount of dead work in clearing the mine of debris. During the temporary stoppage of active mining operations the 20-stamp mill was kept running on a large pile of quartz previously mined, and hoisted through the old shaft. A shaft is also being sunk on the Alabama vein. It has a good, substantial hoisting plant and a Cornish pump. This shaft is at present the principal source of water-supply for the mill, as water is scarce in the neighborhood. A succession of dams has been built in the gulch below the mill, where the tailings are settled and the water pumped back. Sixty-three men are employed. Sierra Buttes Gold Mining Co. (Ltd.), of London, owner; William Johns, of 320 Sansome Street, San Francisco, general manager; A. G. Briggs, of Mariposa, superintendent.

*Wilson Mines* (Quartz).—They are 1 mile E. of Hornitos, on the Wilson ranch, a tract of 480 acres, in which are several quartz veins. The quartz is crushed in a 2-stamp mill having discharge on three sides, the capacity being 6 tons per day. Power is furnished by an oil-engine. The mill has one Triumph concentrator. Six men are employed. Rose McCann, of Hornitos, owner.

*Wilson & Pedburg Mine* (Quartz).—It is 8 miles E. of Coulterville, and has a 30′ shaft and a cross-cut tunnel to the vein. Wilson & Pedburg, of Coulterville, owners.

*Yellowstone Sirocco Mine* (Quartz).—See our XIIth Report, p. 175. It is 1½ miles W. of Bear Valley, just outside of the "Grant." It has a 400′ shaft on a vein in diabase. Equipped with a steam hoist. The gold is found in quartz, calcite, and amphibolite schist. Fourteen men are employed. Yellowstone Mining Co., of San Francisco, owner; C. H. Burt, of Bear Valley, superintendent.

## MILLS IN MARIPOSA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Bondurant | | 10 | 850 | | | | | | | |
| Compromise | | 10 | 850 | | | | | | | |
| Farmers' Hope | | 5 | 750 | | | | | | | |
| Flyaway | | 5 | 750 | | | | | | | |
| Hite | Water | 40 | 750 | 50 | 2 | (20 stamps | work | ing.) | | |
| Horseshoe | | 5 | 750 | 12 | 2 | | | | | |
| No. Nine | | 30 | 750 | | | | | | | |
| Potosi | | 40 | 850 | | | | | | | |
| Quail | | 10 | 750 | | | | | | | |
| Quartz Mountain | | 10 | 850 | 25 | | | | | | |
| Red Cloud | | 10 | 800 | | | | | | | |
| Santa Rosa | | 10 | 850 | 25 | 2 | Johnson | | | | |
| Tyro | | 10 | 850 | 25 | 3 | Frue | | | | |
| Vanderbilt | | 10 | 850 | 25 | | | | | | |
| Virginia | | 10 | (In poor | condition.) | | | | | | |
| Whitlock | | 20 | 850 | 50 | 8 | Frue | | | | |
| Wilson | | 2 | 900 | 6 | 2 | Triumph | | | | |
| Yellowstone | | 5 | 750 | 15 | | | | | | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MARIPOSA COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Cranberry | Water | 2 | Arrastras | | 1½ | | | | | | |
| Manzanita | | | Arrastras | | | | | | | | |
| Mexicans' | | | Arrastras | | | | | | | | |
| Rutherford | | | Arrastras | | | | | | | | |

## Mendocino County.

The mineral wealth of this county, although considerable, has never received the attention it deserves. The coal beds on Eel River and at Round Valley are probably the largest deposits in the State. Copper is found in Eden Valley and near Ukiah; bituminous rock occurs in large deposits near Point Arena, and chromic iron is known to exist in several localities. No mining, but only some prospecting on copper properties, is being prosecuted in this county. The agricultural interests center in the large valley of Russian River; grapes, fruit, and hops being the principal products. Lumbering is carried on extensively along the coast, on several small streams heading in the redwood belt. The dairy interests are also large.

*Bay Edgar Mine* (Quartz).—See our XIIth Report, p. 176. It is on Red Mountain, 12 miles S.E. of Ukiah, at 2,000′ altitude. A tunnel has been driven 25′ to cross-cut the vein, and a drift started east. The vein shows 20″ of quartz, standing vertically. The cost of transporting the ore to water has retarded development. Idle. C. H. Stout, of Ukiah, owner.

*Van Allen Mine* (Quartz).—See our XIIth Report, p. 177. It is situated in the hills, 6 miles W. of Ukiah, at 1,000′ altitude. The tunnel has been driven 35′, through a tough glaucophane schist, to tap the vein lower down the hill, and it is supposed that 15′ more will cut the ledge. William Van Allen, of Ukiah, owner.

## Mono County.

*Adrian Mine* (Quartz).—See New Enterprise.

*Bay Queen Mine* (Quartz).—See our XIIth Report, p. 177. It is 3 miles S.W. of Lundy. Finley Cameron, of Bodie, owner.

*Beautiful Bells Mine* (Quartz).—See Sunshine.

*Bishop Mine* (Quartz).—See New Enterprise.

*Blackwood Mine* (Quartz).—See New Enterprise.

*Bodie Mine* (Quartz).—Situated in Bodie. No new developments, but it is being exploited on the 200′ and 300′ levels by drifts and cross-cuts. John W. Kelly, of Bodie, superintendent.

*Bodie Tunnel and Bechtel Mines* (Quartz).—They are 1 mile N. of the Standard Mine, and have a series of veins from 6″ to 3′ wide. These mines are tapped by a 5′x 7′ tunnel, 1,100′ long, at the mouth of which is a 15-stamp steam-power mill, with 40 H.P. engine and boiler. A small cyanide plant, of 10 to 15 tons daily capacity, has been erected in the mill. The mines have been leased to tributers, who store the ore in the chutes until sufficient has been accumulated to run the mill a short time. The tailings are impounded, and will be cyanided. Cain & McCone, of Bodie, owners.

*Booker Flat Tailings.*—The tailings from the Noonday and Red Cloud mills, previous to 1878, accumulated to a depth of 1′ to 5′ over a 100-acre tract, which has recently been located as placer ground. In places the tailings have become so hard that a plow has been used to loosen them. They are worked by the South End Cyanide Plant. J. S. Cain et al., of Bodie, owners.

*Bryant Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 371 and 177. It is 3 miles S. of Lundy. No recent developments. R. T. Pierce, of Lundy, owner.

*Bulwer Mine* (Quartz).—See our VIIIth Report, pp. 389 and 396–98. Situated at Bodie. Ten men are employed in stoping, above the tunnel level. J. W. Kelly, of Bodie, superintendent.

*Cain's Cyanide Plant.*—It handles the tailings from the Bodie Tunnel mill. Capacity, 20 tons daily.

*Charlestown Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 385 and 177. It is situated on the side of the mountain, at 8,700′ elevation, overlooking Mono Lake. Developed by tunnels and cross-cuts. Idle. J. P. Hammond, of Mono Lake, owner.

*Columbia Mine* (Quartz).—See our XIIth Report, p. 178. It is 12 miles W. of Bodie. Idle. T. Albright, of Lundy, owner.

*Consolidated Mine* (Quartz).—See New Enterprise.

*Contention* (*Addenda*) *Mine* (Quartz).—See our VIIIth Report, p. 392. This is a recent relocation, and lies S. of the Standard Mine. A small steam hoist has been erected on the old 400′ shaft, and it is now being cleaned out and retimbered. It is reported that a large amount of low-grade ore remains untouched in the mine, and it is the intention of the owners to treat it by the cyanide process. Cain, Kelly & McCone, of Bodie, owners.

*Cowboy Mine* (Quartz).—It is in Castle Peak District, 12 miles S. of Bridgeport, at 7,500′ elevation. On the bold croppings a 60′ incline has been sunk. R. A. Cameron, of Bridgeport, owner.

*Cyanide Process.*—There are six cyanide plants in and around Bodie, in which accumulated tailings of the different stamp mills are treated. They are the *Cain*, *New Standard*, *South End*, *Standard*, *Tarr & Tyack*, and *University* plants. The *modus operandi* is similar in all. See our Bulletin No. 5, by Dr. A. Scheidel.

*Dark Horse Mine* (Quartz).—See our XIIth Report, p. 178. It is 10 miles N.E. of Bishop Creek. No recent developments. J. H. Bulpit, of Bishop Creek, owner.

*Defiance Mine* (Quartz).—See our VIIIth Report, pp. 383–385. It is situated near Bodie, and until the fall of 1895 has been idle for a number of years. The old 800′ shaft is now being retimbered.

*Dogtown Diggings* (Placer).—Situated 9 miles S. of Bridgeport, at 7,000′ elevation, and comprises 140 acres of gravel, 15′ to 25′ deep. It is worked by Chinese tributers, with free water under a light pressure. C. Anderson, of Bridgeport, owner.

*Duarte Mine* (Quartz).—See our XIIth Report, p. 178. It is 5 miles N.E. of Laws. Idle. Charles Duarte, of Laws, owner.

*Dunderberg Mine* (Quartz).—See our XIIth Report, p. 178. It is 12 miles S. of Bridgeport. Exploited by a 700′ cross-cut tunnel and 350′ of drifts. No recent developments. A. F. Bryant et al., of Bridgeport, owners.

*Erie Mines* (Quartz).—This group comprises ten claims, situated on the northern slope of Prospect Mountain, 1½ miles N. of Lundy. The Erie tunnel is 2,600′ lower than the croppings of the May Lundy, on which vein these claims are located; it is now in some 700′. R. T. Pierce, of Lundy, superintendent.

*Eva Mine* (Quartz).—It is situated on the northwestern slope of Bodie Bluff, and is prospected by a 1,200′ cross-cut tunnel. Four veins, 12″

to 36″ wide, and low-grade, have been intersected. Assessment work only. W. A. Loose, of Bodie, owner.

*Excelsior Mine* (Quartz).—See Mabel.

*Faulk Mine* (Quartz).—See our XIIth Report, p. 178. It adjoins the Mammoth Mine, in Lake Mining District. Idle. D. C. Albright, of Bishop Creek, owner.

*Goleta* (*Detroit*) *Mines* (Quartz).—See our XIIth Report, p. 178. This group comprises the *Goleta*, *Montecito*, and *Sterling* mines, and they lie on the eastern slope of the Sierra, about 6 miles N.E. of Lundy. They are exploited by numerous cross-cut tunnels, shafts, winzes, and drifts Tunnel No. 1 had progressed 1,190′ when work ceased on account of poor air. A seven miner's inch flow of water was encountered in the face, and was considered a favorable indication for an ore-body. Tunnel No. 2 has been driven 470′ on the vein, and four cross-cuts, 118′, 46′, 72′, and 66′, run therefrom, all in ore. The croppings are very noticeable, standing 60′ and more high, and continuing 7,000′ or more in length. A tunnel, called the Combination, has been started, and a 200-acre mill-site taken up close by. A 2¾-mile ditch is projected from Mill Creek, which will give a 300′ head at the mill-site with 1,700′ of pipe. The altitude at the mill-site is 7,500′; at the Combination tunnel, 8,150′, and at Tunnel No. 2, 8,500′. Gold, silver, and copper are contained in the ores. A new 40-stamp water-power mill was built in September, 1896. Goleta Mining Co., of No. 330 Pine Street, San Francisco, owner; D. E. Jones, of Lundy, superintendent.

*Gorilla Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 370 and 179. It is situated on the northern slope of Mount Scowdan. No recent developments. Gorilla M. & M. Co., of San Francisco, owner.

*Gray Eagle Mine* (Quartz).—See our XIIth Report, p. 179. It lies 1 mile S.W. of Lundy. No recent developments. F. Pierce, of Lundy, owner.

*Harrison Mine* (Quartz).—See our XIIth Report, p. 179. It is 1 mile S.W. of Lundy, at 9,200′ elevation. No new developments. A. L. Butterfield, of Lundy, owner.

*Headlight Mine* (Quartz).—See Monte Cristo.

*Hinda Rose Mine* (Quartz).—See Sunshine.

*Hirsch Mine* (Quartz).—See Reward.

*Homer M. & M. Co.'s Mines* (Quartz).—See our Xth and XIIth Reports, pp. 342 and 179. They lie on the western slope of Mount Scowdan. No recent developments. Company's office, No. 330 Pine Street, San Francisco.

*Homestake Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 360 and 180. It is in Silverado Cañon, and the ore carries about equal amounts of gold and silver. Idle. Andrew Sayers, of Bridgeport, owner.

*Jackson and Lakeview Co.'s Mines* (Quartz).—See our VIIIth and XIIth Reports, pp. 371 and 180. They are 5 miles S. of Lundy, on the eastern slope of Mount Scowdan, and comprise the *Jackson*, *Lakeview*, *May Lundy*, and *North May Lundy* claims. They course N. and S., and dip 30° to 74° W. The lode is exploited by numerous tunnels, drifts, shafts, and winzes. Tunnels Nos. 1, 2, and 3 are on the lode, and are 112′, 720′, and 1,140′ long, respectively. Lakeview cross-cut tunnel is 418′ and the Jackson cross-cut tunnel 220′ long. The breasts of these tunnels are about 700′ vertically below the croppings, and several hundred feet of drifts have been driven. The ore is transported from the

Lakeview tunnel 2,560′ by an overhead $1\frac{1}{16}$″ (Hallidie) rope tram, over a very rugged and steep mountain side, to the 10-stamp water-power mill. The ropeway supports are 14′ to 34′ high and 100′ to 200′ apart. The automatic dumping buckets are 125′ apart, and carry 120 lbs. each. Thirty tons of ore are delivered in nine hours. Hooks on the rope are used to convey supplies to the mine. The stamps of the mill weigh 1,000 lbs. each and are dropped 98 times per minute. The mill is supplied with Challenge ore-feeders, a Gates crusher, and Frue vanners. Power is supplied by water from Lake Oneida, through 760′ of pipe, under 140′ head, acting upon a 4′ Pelton wheel. A 25 H.P. engine and boiler are held in reserve as auxiliary power. A chlorination plant, with a capacity of 2 tons per day, was completed in 1895, and consists of a Bruckner furnace, 6′x 12′, revolving once in $3\frac{1}{2}$ minutes; one steel, $5\frac{1}{2}$′x $7\frac{1}{2}$′, chlorination barrel, lined with lead, and revolving 6 times per minute; two settling-tanks, 8′ in diameter and 32″ deep; and three 5′x 7′ precipitating-vats. The altitude at the mill is 9,660′; at Lakeview tunnel, 11,230′, and at the croppings, 12,500′. There are 47 men employed, as follows: In the mine, 36; mill, 4; chlorination plant, 2; tramway, 2; roustabouts, 2; assay office, 1. R. T. Pierce, of Lundy, superintendent.

*Johnnie and Rose of the West Mines* (Quartz).—See our XIIth Report, p. 180. They are 16 miles S. of Benton. Idle. J. King, of Benton, owner.

*Last Chance Mine* (Quartz).—See our XIIth Report, p. 180. This is on the same vein as the May Lundy, on the summit of Mount Scowdan. No recent developments. W. F. McKenzie, of Lundy, owner.

*Lora Mine* (Quartz).—See our XIIth Report, p. 180. It is 10 miles S. of Benton. Idle.

*Lucky Morton Mine* (Quartz).—See our XIIth Report, p. 180. It lies 3 miles S. of Lundy, and adjoins the May Lundy. No recent developments. Assessment work only. Frank Todd, of Calais, Me., owner; R. T. Pierce, of Lundy, agent.

*Mabel Mines* (Quartz).—See our XIIth Report, p. 181. They lie on the western slope of the White Mountain range, 11 miles N. of Bishop Creek. This group comprises five claims: *Excelsior*, etc. Idle. Owen Neylon, of Bishop Creek, owner.

*Mammoth Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 373, 341, and 181. Idle. Bank of California, San Francisco, owner.

*Mineral Chief Co.'s Mines* (Quartz).—See our XIIth Report, p. 181. The property consists of four claims, lying on the eastern base of the Sweetwater range, in the Patterson Mining District. Idle. T. C. Sharp, of Clifton, owner.

*Mono Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 396 and 181. Situated on the northern slope of Mount Scowdan. Idle. R. G. Montrose, of Lundy, owner.

*Mono Lake Mining Co.'s Mine* (Hydraulic).—It is 4 miles E. of Lundy, and consists of 400 acres of patented ground. The depth of gravel is unknown, and a 111′ shaft in the center of the claim failed to reach bedrock. The gravel is said to "prospect" from the surface down. Mill Creek, which heads at Mono Lake, flows through the claim. The owner, in 1895, was moving the hydraulic pipe from Mono Diggings, and preparing to hydraulic under a 300′ head. R. N. Graves, of No. 312 Pine Street, San Francisco, owner.

*Mono Queen Mine* (Quartz).—See Native Wonder.

*Monte Cristo and Headlight Mines* (Quartz).—See our VIIIth, Xth and XIIth Reports, pp. 360–375, 341, and 181. Situated in Lake Minin District. Idle. Hon. P. Reddy, of San Francisco, owner.

*Montecito Mine* (Quartz).—See Goleta.

*Native Wonder and Mono Queen Mines* (Quartz).—See our XIIth Report, p. 181. The Native Wonder is on the north side and the Mon Queen on the south side of a steep cañon on the west side of Mon Lake. No recent developments. E. C. Mattly, of Mono Lake, owner.

*Neal Mine* (Quartz).—See our XIIth Report, p. 181. It is 6 mile S.W. of Benton, at 8,000′ elevation. Idle. Hon. P. Reddy, of San Francisco, owner.

*New Enterprise Mines* (Quartz).—See our VIIIth and XIIth Reports pp. 396 and 182. This group of mines comprises the *Adrian*, *Bishop Blackrock*, *Consolidated*, *New Enterprise*, and *Oro* claims. They are old properties, relocated. Idle. Messrs. Cain, McCone & Kelly, of Bodie, owners.

*New Standard Cyanide Plant.*—It is now (May, 1896) under construction some distance below Bodie, where a large body of tailings has been deposited. Capacity, 100 tons daily.

*Noonday and Red Cloud Mines* (Quartz).—See our VIIIth and XIIth Reports, pp. 396 and 182. These mines, ½ mile S. of Bodie, are being worked by tributers, on the 250′ level of the Red Cloud and 400′ level of the Noonday. About every three months the ore is reduced in the Bodie Tunnel Co.'s mill, 1 mile north of and below the mines. A. P. Cameron, A. Graham, and E. L. Reese, of Bodie, lessees.

*Ontario Syndicate's Mines* (Quartz).—See our XIIth Report, p. 182. Its ten claims are situated on Mount Scowdan. Idle. Ontario Syndicate, of Lundy, owner.

*Oro Mine* (Quartz).—See New Enterprise.

*Parrott Mines* (Quartz).—See our XIIth Report, p. 182. On Mount Scowdan. Idle. Mr. Parrott, of Lundy, owner.

*Rattler Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 362 and 182. It lies on the north side of Ferris Cañon, in the Sweetwater Mountains. No recent developments. Faulk, Kirkpatrick & Brown, of Sweetwater, Esmeralda County, Nev., owners.

*Rattlesnake Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 363 and 182. It is 12 miles W. of Bodie. Idle. M. J. Cody, of Lundy, owner.

*Red Cloud Mine* (Quartz).—See Noonday.

*Sacramento Mine* (Quartz).—See our XIIth Report, p. 183. It is in Piute Mining District, 16 miles N.E. from Bishop, at about 6,000′ elevation. The main tunnel has been extended to 300′ and the lower one to 60′ in length. In the end of the main tunnel a 40′ raise is made, and the quartz is being stoped. The vein is about 3′ thick, and is filled with a jaspery quartz stained with iron. A double arrastra driven by an 18″ Dodd wheel, under 273′ pressure, belongs to the property. Water is conveyed through 2,800′ of V flume with 10″ sides, and 650′ of 4″ pipe. The wheel makes 850, and the arrastra shaft 8, revolutions per minute. J. H. Bulpitt et al., of Bishop, owners.

*Scientific Press Mine* (Quartz).—See Sunshine.

*South End Cyanide Plant.*—It is on the Western slope of Queen Bee Hill, 1½ miles S. of Bodie, and has a capacity of 150 tons in twenty-four hours. There are 6 leaching vats, 20′ in diameter and 7′ deep; 4 other

ame size vats for water, stock-solution, and storage; and 2 zinc or pre-ipitating boxes, 24″x 24″x 15′ long. The tailings from the Noonday nill are dumped directly from the wagons into the vats, a substantial oadway passing over them. The stock-solution is raised by a centrifu-al pump operated by steam. J. S. Cain et al., owners; R. Recknagel, nanager and chemist.

*Southern Belle Mine* (Quartz).—See our XIIth Report, p. 183. It is n the White Mountains, 5 miles N.E. of Laws. E. Duenwig, of Laws, wner.

*Spartan Mine* (Quartz).—See our XIIth Report, p. 183. It adjoins he Sterling, 6 miles N.E. of Lundy. Idle. M. R. Burns, of Lundy, wner.

*Standard Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 385 and 183. It is on the hill just east of Bodie. No new developments ince our last Report, all work being confined to and above the 500′ evel. A station is being cut in the west wall of the 800′ level to receive a 30 H.P. 500-volt D. C. motor, geared to a Dow triple pump, which will raise the water to the Bulwer tunnel, 300′ above, where there is a 50 H.P. electric hoist. Since the old hoist was destroyed by fire, all ore and waste are raised to this level and trammed through the tunnel. The property is supplied with a 20-stamp mill and a cyanide plant. The mine, mill, etc., are lighted by incandescent lamps. All the works are run by electricity—see special article, "Electric Power Transmission Plants and the Use of Electricity in Mining Operations," in our XIIth Report, pp. 413–454. A 15 H.P. motor is employed to draw the cars of tailings from the settling-basins to the cyanide works. In consequence of the freezing of the water in Green Creek, which drives the dynamo, 12 miles distant from Bodie, the company has commenced the construction of two storage reservoirs, to insure a constant source of power. The cyanide plant is of 100 tons daily capacity, and the tailings are hauled by wagon to a bin above the plant, and thence by cars to the upper floor of the plant, which is level with the upper edge of the vats. The vats are 7′ deep, 20′ in diameter, and have a capacity of 80 tons each. They are filled with dry tailings, and, when full, a weak solution of cyanide of potassium is applied until saturated. They are allowed to stand from 3 to 8 hours, when a stronger solution is applied for about 12 hours. The liquor is then drawn off, and clean wash-water used from 12 to 20 hours, or until all cyanide is leached out. The tailings are then sluiced out, the filters' bottoms cleaned, and the tanks refilled with a new charge of tailings. There are two sets of zinc boxes; the one for the wash-water, which is wasted after passing through the zinc, and the other for the strong liquor. The latter set comprises three boxes, 16″x 16″x 18′, and uses about 20 lbs. of zinc per day. The resulting gold slimes are purified from the adhering zinc in a vat, painted with asphaltum, by sulphuric acid; when settled it is collected, dried, and melted. The liquor, after passing the zinc, is pumped back to the top, and used as weak solutions, or fortified with cyanide to standard solution and pumped to the vats by a 5 H.P. motor. Standard Consolidated Mining Co., of San Francisco, owner; R. G. Brown, of Bodie, superintendent.

*Sterling* (*Detroit Copper*) *Mine* (Quartz).—See Goleta.

*Summit* (*Kate Rodgers*) *Mine* (Quartz).—See our VIIIth Report, p. 396. It resumed active operations in 1895, after being idle fifteen years.

The 400′ shaft is being retimbered. J. W. Kelly, of Bodie, superintendent.

*Sunshine Mines* (Quartz).—This group of mines, comprising the *Beautiful Bells*, *Hinda Rose*, and *Scientific Press*, are situated on the eastern slope of the Bodie Bluff. On the Sunshine is a 100′ shaft. Assessment work only. W. A. R. Loose, of Bodie, owner.

*Syndicate Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 387 and 184. It is 1 mile E. of Bodie. No recent developments. The 10-stamp steam-power mill runs about half time. The ore-bodies left by the original company are being extracted by tributers J. F. Parr and S. Figue, of Bodie.

*Tarr & Tyack Cyanide Plant.*—It treats the tailings of the Syndicate Milling and Mining Co., and has a capacity of 20 tons daily.

*University Mine* (Quartz).—It lies on the northwestern slope of Queen Bee Hill, ½ mile S. of Bodie, and adjoins the Noonday. The vein courses N.W. and dips slightly E. The 400′ shaft, sunk in 1879, is being retimbered to the 300′ level. On the 100′ level the vein is 2′ wide, and low-grade. On the 300′ level the 22′ cross-cut shows the vein to be 4′ wide. The ore is very "soft," crumbling so much by handling that it has to be screened (75% being sand and 25% coarse stuff) before being sent to the company's 7-stamp steam-power mill, situated 4 miles N. of Bodie. A 20-ton cyanide plant is being erected in the mill building, and the 75% of fine ore will be cyanided direct. A 20 H.P. engine furnishes power. W. A. R. Loose and R. A. Leale, of Bodie, owners.

*Ward Mine* (Quartz).—It lies in Castle Peak District, 12 miles S. of Bridgeport, at about 9,000′ elevation. At the bottom of the 4′x 6′ vertical 140′ shaft, ore is being stoped from the 2′ to 4′ vein, which is encased in porphyry. No sulphurets. A 5-stamp water-power mill belongs to the property, and runs about half time. J. L. McLeoud, of Bridgeport, owner.

*Wild Rose Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 378 and 184. It is situated 8 miles S.E. of Benton. No recent developments. McNamara & Dowd, of Benton, owners.

*Wolverine Mine* (Quartz).—See our XIIth Report, p. 184. It lies on the northern slope of Mount Scowdan, at 9,700′ elevation. No recent developments. Lake Lundy M. & M. Co., of San Francisco, owner; R. G. Montrose, of Lundy, superintendent.

## MILLS IN MONO COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity, in Tons. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Bodie | Steam | 10 | 750 | 30 | | | | | | |
| Bodie Tunnel and Bechtel | Steam | 15 | 850 | 30 | | | | | | |
| Dunderberg | | 20 | 700 | 40 | | | | | | |
| Goleta | Water | 40 | 1,000 | | (10 | Pans) | | | | |
| Jackson and Lakeview | S. & W. | 10 | 1,000 | 30 | | Frue | 1 | 2 | | |
| J. S. Cain | | | | | | | | | 20 | |
| Mammoth | Water | 10 | 900 | 30 | | | | | | |
| Miners | Steam | 7 | 900 | 21 | | | | | | |
| New Standard | | | | | | | | | 100 | |
| Sheehan | Steam | 5 | 600 | 10 | | | | | | |
| South End | | | | | | | | | 150 | |
| Standard | Elect. | 20 | 850 | 50 | | | | | 100 | |
| Syndicate | Steam | 10 | 850 | 20 | | | | | | |
| Tarr & Tyack | | | | | | | | | 20 | |
| Ward | Water | 5 | 800 | 6 | | | | | | |
| University | Steam | 7 | | | | | | | 20 | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MONO COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Monte Cristo and Headlight | Steam | 2 | Huntington | | 48 | | | | | | |
| Sacramento | Water | | Double Arrastra | | | | | | | | |

## Monterey County.

The only gold mines in this county are in Los Burros Mining District, a rough, mountainous region, 45 miles S.W. from Kings City by road and trail, and 3 miles from the ocean. A number of claims were located a few years ago, and some development work done. See our XIth and XIIth Reports, pp. 259 and 184. They have all been idle since our last Report, except the

*Last Chance* (*Cruikshank*) *Mine* (Quartz).—It is in the central part of the district, at about 2,500′ altitude. The Monterey Mining Co. had a bond on it during the spring of 1895, and ran the 5′ Huntington mill for a time, working tailings, etc. The ore occurs in pockets, and is said to run about 8% sulphurets. N. D. Cruikshank, of Mansfield, superintendent.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MONTEREY COUNTY.

| Name of Mill or Mine. | Number | Character. | Diameter | Capacity per 24 Hrs., in Tons. | Concentrators. | |
|---|---|---|---|---|---|---|
| | | | | | No. | Character. |
| Cruikshank | 1 | Huntington | 5′ | 14 | 1 | Frue. |

## Napa County.

The larger part of this county is contained in Napa Valley, one of the most fertile agricultural districts in the Coast Range. Wine, grapes, prunes, etc., are the principal products. Gold and silver occur near St. Helena Mountain, and the latter has been mined with success. Iron ore, magnesite, fire-clay, and building-stone occur in the county, and have been and are still being mined or quarried. In the northern part several large quicksilver mines are situated, and they furnish employment to several hundred men.

*Brown & Smith Cons. Mine* (Quartz).—It is situated in Kings Cañon, 2½ miles N. of Calistoga, at 775′ elevation. It is developed by a 60′ incline shaft on the vein and a 200′ cross-cut tunnel. The country rock is a soft, gray porphyry. Idle. Dr. W. D. Smith et al., of Calistoga, owner.

*Griffith Mine* (Quartz).—This is a new discovery on Atlas Peak, 17 miles N.E. of Napa. An open cut, 10′ deep, discloses a vein of porphyry and quartz 3½′ thick. The quartz shows pyrite. A shaft is now (1895) being sunk on the vein. Ed Griffith et al., of Napa, owners.

## Nevada County.

*Allison Ranch Consolidated Mining Co.'s Mine* (Quartz).—See our XIth Report, p. 268. It is on Wolf Creek, 3 miles S. of Grass Valley, at 2,000′ elevation, and comprises 60 acres, including the Allison Ranch and Stanton Mines. After a long period of inactivity this mine is to be reopened. The vein, about 2′ wide, trends N. and S., and dips 33° W.,

n a grano-diorite formation. There were two inclines on the old mine; he north one was 700′ deep, with seven levels, and the south one 300′ eep, connecting with the north shaft on the 300′ level. In all, there are bout 1,000′ of drifts. A combination hoist building and a separate boiler-ouse are being erected. Water-power and a compressor plant will be rected, using 200 miner's inches, under 235′ pressure. Fifteen men are rading. An incorporated company, of San Francisco, owner; J. E. Valch, Nevada Block, San Francisco, secretary.

*Alpine* (*St. Louis and Wild West*) *Mine* (Quartz).—It is 2 miles E. of Nevada City, at 2,725′ elevation, and comprises two claims. The two parallel veins, about 1½′ wide, strike N.E. and S.W., and dip 70° W., in granite. The quartz carries a small percentage of iron and lead sulphurets. The developments comprise a 700′ tunnel, a cross-cut to the S.W., 143′ long, and an upraise connecting with the surface, 125′ above. Two men are employed. — Morgan et al., of Nevada City, owners.

*Annie Mine* (Quartz).—See Glenn.

*Arctic Mine* (Quartz).—It is on Cañon Creek, 7 miles N.E. from Washington, at 4,750′ elevation. The vein strikes N. and S., and dips 60° E., in a granite formation, showing 2½′ of quartz. There are two short tunnels, each 20′ in length, giving, when extended, 150′ of backs on the vein. Two men are prospecting. O. Helgesen et al., of Washington, owners.

*Atlantic Mine* (Quartz).—It is 1½ miles S.E. of Eureka, at 5,450′ elevation. The vein strikes N. 12° W., and dips 45° E., showing 2½′ of quartz between granite walls. There are two cross-cut tunnels; No. 1 is 200′ long; No. 2, 200′ farther east and 40′ below, is 130′ long. One man is at work. G. O. Rooker, of Eureka, owner.

*Badger Hill Mine* (Hydraulic and Quartz).—See our XIIth Report, p. 185. It is 1 mile S.E. of Cherokee. Badger Hill Gold Mining Co., of North San Juan, owner.

*Baltic Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 451 and 185. It is 5 miles S. of Graniteville, in God's Country Ravine. J. McBean et al., of Washington, owners.

*Beckman Mine* (Quartz and Hydraulic).—See Mayflower.

*Belle-Fontaine Mine* (Quartz).—See our XIIth Report, p. 185. It is on Deer Creek, 3 miles E. of Nevada City, and comprises 1,200′ by 350′. Since our previous Report, the lower tunnel has been extended 200′, showing an ore-shoot 210′ long and averaging 2′ wide; a 260′ upraise has also been made on the slope of the vein. Ten men have been employed, though temporarily idle. W. J. Smith et al., of Nevada City, owners.

*Berriman Consolidated Gold and Silver Mining and Milling Co.'s Mine* (Quartz).—It is on Wolf Creek, in Grass Valley, at 2,575′ elevation, and comprises the *Berriman* and the *Dromedary* claims. The Dromedary is the larger vein, and has a history as a rich producer; it trends slightly W. of N., and is cut through by the Berriman vein, which then turns and follows the course of the Dromedary on the under side, with but a few feet of wall rock intervening. Both veins pitch west, in a grano-diorite formation, the Berriman somewhat the steeper, and are from 4″ to 2′ or 3′ in width. On the Dromedary is a 5½′x 10′ incline, 300′ deep, from which a drift extends 400′ N. On the Berriman is a 65′ incline, with stopes to the surface. Two pay-shoots on the Dromedary pitch

south. The mine is idle. An incorporated company, of Grass Valley owner; N. Berriman, of Grass Valley, manager.

*Big Blue Mine* (Quartz).—See Lone Star.

*Big Ravine Mine* (Hydraulic).—It is 5½ miles N.W. from Nevada City, at 2,600′ elevation, and contains 2 acres of workable ground, or an outbreak from the Blue Tent gravel channel. The gravel bank is 12′ high with 25′ face, contains 65% of cobbles and bowlders, and carries coarse gold. It is worked with 100 miner's inches of water from the Blue Tent ditch, brought through 1,000′ of ditch and 600′ of 7″ pipe, and delivered under 100′ pressure to a 2½″ nozzle. The working is done through 10 boxes, 20″ wide, set on an 8″ grade to the box, using slat riffles; the tailings are dumped behind a crib dam, 5′ high, built on an old reservoir dam in Big Ravine. One man is employed. T. P. Kirkham, of Nevada City, owner.

*Birdseye Creek Gold Mining Co.'s Mine* (Hydraulic).—It is ½ mile E. of You Bet, at 2,910′ elevation, and comprises 700 acres. The work is on the old Blue Lead channel running N. and S., and has an average width of 500′, with a depth of 300′ of gravel, mostly quartz. About 1 mile of the channel has been worked. At present only ground-sluicing. The water is taken from the head of Steep Hollow, through 12 miles of ditch, with a ⅝″ per rod grade, 4′ on top, 3′ on the bottom, 2′ deep, and with a capacity of 1,400 miner's inches, delivered under 250′ head, through 1,000′ of 22″ pipe. Twenty-five men are employed. C. Goodwin, of You Bet, owner.

*Black Prince Mine* (Quartz).—See Mountaineer.

*Bluejay Mine* (Quartz).—It is 5 miles N.E. of Washington, adjoining the Central Mine, at 4,250′ elevation. The vein strikes W. of N., dips 65° E., in granite, and shows 4′ of quartz. The development consists of a 300′ tunnel, and a 100′ shaft sunk below the tunnel level at a point 200′ from the mouth. This shaft passes through the pay-shoot, which is 100′ long, pitching south. The quartz carries about 3% sulphurets. Some stoping has been done, both above and below the tunnel level. For hoisting, a windlass run by water-power is used, and the 2″ double-action pump is driven by a hurdy wheel, under 150′ pressure, with water obtained from Fall Creek, through 6 miles of ditch of 100 miner's inches capacity. A 5-stamp mill, with 750-lb. stamps, driven by a 4′ Pelton wheel under 200′ head, requiring 15 miner's inches of water, is attached to the property. Below the mill is a small canvas plant of four sections, each 18′ long. The mine has been idle for two months, but employs, when working, 5 men. M. H. Baugh and G. Bouney, of Washington, owners.

*Blue Lead Mine* (Drift).—It is in Logan Cañon, ¾ mile from Relief Hill, at 3,650′ elevation, and comprises 480 acres on a lava-capped channel having a N. and S. course. It is worked through a bedrock tunnel 2,500′ long, which is being driven ahead; at the present no gravel is being breasted. The channel, 20′ and over above the main tunnel, is worked through an upraise connecting the two. The dimensions of the main tunnel are 6½′ high, 4½′ wide on top, 7′ on bottom; the back portion of the tunnel is in swelling ground. The gravel drifts are carried 6′ high; the ground is hard-picking, and contains some very large bowlders; the gold is of medium size. The dump has a capacity of 100 tons, the gravel being washed once a week through 18″ flumes set on a 9″ grade, with free water for five months, and with water from Malakoff

ditch the remainder of the season, using 150 miner's inches. Five men are at work. A. Roach, Ch. Haggerty et al., of Moore's Flat, owners.

*Boss Mine* (Quartz).—See North San Juan Co.

*Boston Ravine Mine* (Quartz).—See Massachusetts Hill.

*Brandy Flat Mine* (Drift).—It is near Moore's Flat, and comprises 15 acres. The channel is being worked through a bedrock tunnel 150′ long, with a 20′ upraise to the gravel, which is worked 6′ high, and timbered with post and cap. The numerous big bowlders are removed by blasting. A breaster takes out 2 tons of gravel per shift; the gravel contains coarse gold. Four Chinese are at work. Ah Moy, of San Juan, owner.

*Brunswick Consolidated Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 431, 381, 274, and 186. It is 2½ miles S.E. of Grass Valley, on Sec. 25, T. 16 N., R. 8 E., at 2,800′ elevation. The main three-compartment shaft is down 800′, and is furnished with a pumping and hoisting plant and a Rix double compressor; the power is water, acting on Pelton wheels. Fifteen men are employed. J. M. English, of San Francisco, owner; F. Niles, of Nevada City, superintendent.

*Buckeye Mine* (Quartz).—It is 3 miles N.E. from Nevada City, at 2,600′ elevation. The vein strikes N. and S., and dips 60° W. between slate and granite walls, showing from 1′ to 3′ of quartz. The main tunnel is 500′ in length on the vein, cutting two ore-shoots that have been stoped from this level about 120′ to the surface. From the bottom of the 210′ main incline a drift has been run both 150′ N. and 300′ S., and some stoping done. A second incline, 90′ deep, has been sunk to the N., in good ore. Two men are employed. T. B. Gray, of Nevada City, owner.

*Bullion Consolidated Mine* (Quartz).—It is 2½ miles S. of Grass Valley, at 2,400′ elevation. It is supposed to be an extension of the Alaska Mine. The vein strikes N. and S., varies in dip from 15° to 20° E., and is from 2′ to 4′ wide in grano-diorite. It is being worked through a 5′x13′ double-compartment incline shaft, 240′ on the slope or 100′ perpendicular. The hoist and pump are run by a 40 H.P. steam-engine. The 9″ pump has a 6′ stroke, making 4 strokes per minute. Eleven men are employed. An incorporated company, owner; C. Grow, Mills Building, San Francisco, secretary; W. B. Fowler, of Grass Valley, superintendent.

*Cadmus Mine* (Quartz).—It is 1½ miles W. from Nevada City, at 2,400′ elevation, and comprises 1,500′ by 600′ on the south side of Deer Creek adjoining the Home Mine. Several veins are on the property, with a general N.W. and S.E. course, but with different dips; the most southerly dips east, the center one perpendicularly, and those beyond to the west. All of them are in slate, though in close proximity to the granite contact. They average 2′ in width. A 5′x10′ perpendicular shaft, well timbered and lined, reaches 120′ to date, but will be continued to 200′ in depth. At 50′ a drain tunnel from Deer Creek taps the shaft. Tunnels have been driven from the creek on each of the veins, the longest extending 300′ and showing a 2′ vein of quartz, carrying iron, copper, and lead sulphurets. Four miner's inches of water are pumped from the shaft with a 10″ jackhead pump, which, as well as the hoist, is driven by two 4′ Pelton wheels, working under 193′ pressure, with water from the Excelsior Water Co.'s ditch. The pump has a 5′ stroke, and makes 8

strokes per minute. Eleven men are employed. An incorporated company, of San Francisco, owner; C. Kahl, of Nevada City, superintendent.

*Caledonia (Montreal) Mine* (Quartz).—It is on Old Man Mountain, 3 miles N.W. from Meadow Lake, at 7,400′ elevation, and comprises 3,000′ by 600′. The vein, 8′ to 9′ wide, strikes N.W. and S.E., and dips S.W., between syenite walls. There are two tunnels, each about 150′ long, and several surface cuts. The quartz is heavily mineralized, and said to carry 7% of sulphurets. Three men are employed. W. H. Leman and J. Williams, of Cisco, owners.

*California Mine* (Quartz).—See our XIth Report, p. 308. It is 4 miles W. of Grass Valley, at 2,250′ elevation. An incorporated company, owner; L. E. Clinch, of Grass Valley, manager.

*Canada Hill Consolidated (Charonatte) Mine* (Quartz).—It is 1½ miles S.E. from Nevada City, at 2,760′ elevation, and comprises 55 acres of patented ground. There are four veins along the granite contact striking N. and S., and dipping both E. and W. They vary in width from 3″ to 20″ and are heavily mineralized, the ore being of similar character to the Beckman vein, in the Mayflower Mine, and high-grade in places. The old workings in this mine, said to be 1,300′ deep on the slope, are inaccessible, on account of water; the recent works are confined to what is designated as the Grant vein, where a 300′ incline 5′x 7′ shaft has been sunk. Short drifts at the bottom expose a 16″ vein. The incline is tapped at 125′ by a short drain tunnel. The old incline was similarly tapped at 200′. There is a hoist at the shaft worked by an 8′ wheel, under 432′ pressure, taking water from South Yuba Ditch Co., through 2,800′ of 18″ to 7″ pipe. The water from the Grant shaft is raised by an "ejector." The mine is under bond, and idle. G. C. Gaylord, of Nevada City, owner.

*Cedar Mine* (Quartz).—See our XIIth Report, p. 186. It is in Bear River District, 14 miles from Grass Valley, on Secs. 20 and 29, T. 14 N., R. 8 E. J. R. Nickerson, of Auburn, Placer County, owner.

*Centennial Mine* (Quartz).—See our XIth and XIIth Reports, pp. 280 and 186. It is near the summit of Osborn Hill, 2 miles S.E. of Grass Valley, at 3,000′ elevation. H. Sylvester, of Grass Valley, owner.

*Centennial Mine* (Quartz).—It is 7 miles N.E. of Washington, on Cañon Creek, at 4,500′ elevation. The 1′ wide vein strikes N. and S., and dips 60° E. in protogene. There are three tunnels on the vein; No. 1 is 120′, No. 2 is 90′, and No. 3 is 90′ long, giving from the lowest tunnel 300′ of backs. Two men are employed. Marcot & Nelson, of Washington, owners.

*Central and Gray Eagle Mines* (Quartz).—They are 5 miles N.E. of Washington, at 4,025′ elevation, and comprise three claims. The 4′ vein strikes N. and S., and dips 60° E., near the slate and granite contact. The developments consist of several shallow shafts and a 60′ tunnel cross-cutting for the ledge. Two men are at work. Tiernan & Richards, of Washington, owners.

*Central Gravel Mining Co.* (Drift).—See our XIIth Report, p. 186. It is 10 miles N.E. of Nevada City, at 3,800′ elevation, and comprises 170 acres. The main tunnel has been extended 200′, making it 1,100′ in length. Seven men are employed. Central Gravel Mining Company, of Sacramento, owner; Mr. Fold, of Nevada City, superintendent.

*Central North Star Mine* (Quartz).—See our XIth and XIIth Reports, pp. 277 and 187. It is 2 miles S. of Grass Valley, at 2,480′ elevation,

Champion Mine, Mills, and Furnace.

and comprises two claims, one 1,500′ by 600′ and one 1,200′ by 600′. The 2′ vein strikes E. and W., and dips 20° N., in diabase. Central North Star Mining Co., owner; J. Bennallack, of Grass Valley, superintendent.

*Central Pacific Mine* (Quartz).—See our XIIth Report, p. 187. It is ¾ mile S.W. from Rough and Ready. Idle. Moody & Gayety, of Gold Run, Placer County, owners.

*Champion Consolidated Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 420, 386, 286, and 187. It is on Deer Creek, 1 mile W. from Nevada City, at 2,400′ elevation, and comprises over twenty-three claims, including the *Merrifield* and *Wyoming*. Four veins are included in the property. Since our last Report, the mine was idle for a considerable period, through legal complications, causing considerable repair work on resumption of operations. The 5½′x 15′ three-compartment main incline has been continued to 1,400′ in depth. Large ore-bodies are being stoped between the 1,000′ and 1,200′ levels, and the drifts extend over 800′ N. from the shaft. A new 5′x 8′ shaft has been started on the *Merrifield*, and has reached 300′ in depth. The crushing capacity has been increased by the addition of a new 40-stamp mill, of 1,000 lbs. each, making 70 stamps in all. The chlorination works have been enlarged from a 3-ton to a 4-ton capacity per day, by the addition of extra vats. An electric-light plant has likewise been added, consisting of a Westinghouse 110-volt dynamo, furnishing 85 incandescent lights of 16 candle-power. The power is obtained from the Excelsior Water Co.'s Ditch, the water being applied to 13 Pelton wheels. The working force consists of 125 men. Champion Consolidated Gold Mining Co., of No. 314 Crocker Building, San Francisco, owner; J. F. Holbing, secretary; Fred Zeitler, of Nevada City, superintendent.

*Charonatte Mine* (Quartz).—See Canada Hill.

*Coan Mine* (Quartz).—It is 3 miles W. of Nevada City, at 2,425′ elevation. The vein strikes N.W., and dips 45° S.W. along the contact, from 18″ to 3′ wide. There is a 100′ incline, tapped at 40′ by a 100′ drain tunnel, and from the bottom of the shaft extend two short drifts, about 50′. A 4-stamp mill, to be run by water-power, is on the ground, though not yet erected. A friction hoist and bucket pump are arranged to be run by Pelton wheels. The mine is idle. M. Coan and partner, of Nevada City, owners.

*Coe Mine* (Quartz).—See Lone Star.

*Columbia* (*White Ledge*) *Mine* (Quartz).—It is 2 miles N. from Meadow Lake, at 6,900′ elevation. The vein courses N.W., and dips S.W., between slate walls varying from 6″ to 2′ in width. There are two shafts on the vein, 100′ deep, and a long cut on the outcrop. Two men are employed. R. A. Campbell, of No. 1014 Sixteenth Street, Oakland, owner.

*Congo Mine* (Quartz).—See Goodall Consolidated Gold.

*Conlon Gold Mining Co.'s Mine* (Quartz).—See our XIIth Report, p. 187. It is on Osborne Hill, 2½ miles S.E. from Grass Valley, at 2,900′ elevation. Conlon Gold Mining Co., of Grass Valley, owner.

*Constitution Mine* (Quartz).—See Jesse Consolidated.

*Crown Point* (*William Penn*) *Mine* (Quartz).—See our VIIIth Report, p. 429. It is in the suburbs of Grass Valley, at 2,350′ elevation. The property embraces two claims, and has been idle for a number of years, but is at present being reopened by a French syndicate. The old 10-

stamp mill is to be enlarged by the addition of 10 stamps and the required number of concentrators. The company own their own water-power, taking it from Wolf Creek through 1 mile of ditch, with a grade of ½″ per rod. Eighteen men are employed. Crown Point Mining Co., of Paris, France, owner; — Berteaux, secretary; M. Chambry, of Grass Valley, superintendent.

*Culbertson Mine* (Quartz).—See our XIIth Report, p. 188. It is 2 miles W. from Graniteville, or Eureka, at 4,110′ elevation. The vein strikes N. 18° W., dips 50° E., in a clay-slate formation, and is from 1′ to 6′ wide. The quartz is said to carry from ½% to 1% of iron sulphurets. A 5′x 11′ 8″ (in the clear) three-compartment incline is 70′ deep and has a hoist and two 10″ pumps, a bucket, and a plunger working at 8 strokes of 6′ per minute. The entire plant is run by a 6′ Pelton wheel, under 300′ pressure, taking 45 miner's inches of water from the Eureka Lake Ditch Co., brought through 600′ of 11″ to 7″ pipe. There are also two 2½″ ejectors working under 300′ pressure, which raise the water 70′. On account of the very wet and heavy ground the timbers have to be set very close. The drain tunnel, 350′ long, taps the incline at 70′. Thirty miner's inches of water passes through the drain tunnel. The ore is trammed to the adjacent 10-stamp mill, which carries 1,000-lb. stamps. The mill has no concentrators, but a canvas plant of 6 sections, each 16′ long, and sluices with Hungarian riffles, are below the aprons. The mine is only run during the summer season, when 20 men are employed. D. Moore and partner, of Graniteville, owners.

*Cyane Mine* (Quartz).—See Jesse Consolidated.

*Daisy Hill Mine* (Quartz).—It is 2 miles S.E. of Grass Valley, at 2,700′ elevation. The vein strikes N. and S., and dips W., on what is supposed to be an extension of the Rich Hill vein of the Ophir Mine; it is from 3″ to a few feet wide, between a slate foot-wall and grano-diorite hanging-wall, and is said to carry a good grade of sulphurets. There is an incline shaft 250′ deep, besides a number of shallow shafts; drifts have been extended 300′ to 400′ from the incline, and on the north side it has been stoped up to the surface. A steam hoist and pumps are at the shaft. Idle. C. Kingsley, of San Francisco, owner.

*Deadwood Mine* (Quartz).—It is 2½ miles E. from Nevada City, at 2,650′ elevation, and comprises 95 acres of patented ground. The 20″ vein strikes N.E., and dips 25° N.W., in granite. The vein is very heavily mineralized, and the sulphurets are said to be of a very good grade. A 550′ shaft has been sunk on the vein, and a 1,200′ tunnel taps the shaft at 158′ from the surface. Three pumps, 10″, 6″, and 4″, as well as the hoist, are driven by a 12′ hurdy wheel, under 320′ head, with 15 miner's inches of water from the Snow Mountain ditch, and through 1,200′ of 7″ pipe. The 8-stamp mill has been burned.

*Delaware* (*West Harmony*) *Mine* (Drift).—It is 2 miles N.E. from Nevada City, at 3,075′ elevation, and comprises 140 acres, including the West Harmony ground, which is practically worked out. The present workings are down stream, on the Harmony channel, where two parallel gangways are being driven, about 60′ apart, down the center of the channel, to permit of breasting out the ground up stream. The old West Harmony incline, 520′ long, is made use of with a 6′x 7′ gangway, 1,100′ long. The breasts are carried 4′ to 6′ high, and from 60′ to 100′ wide. The gravel is partially cemented, and carries 66% of cobbles and bowlders, which are stored. The gravel is crushed in a 15-stamp water-

power mill with 800-lb. stamps and No. 12 steel wire screens, running at 84 drops and crushing 120 tons per day with chrome steel shoes and dies. The timbering is expensive, on account of swelling ground; the breasts are secured with sets, and lagged overhead. Forty men are employed. R. McMurray and W. H. Martin, of San Francisco, owners.

*Delhi Mine* (Quartz).—See our VIIIth and XIth Reports, pp. 444 and 305. It is 3½ miles W. from Columbia Hill, at 2,500′ elevation. Idle. Delhi Mining Co., of North Columbia, owner.

*Derbec Mine* (Drift).—See our VIIIth and XIth Reports, pp. 456 and 311. It is 1 mile N.W. from North Bloomfield, at 3,780′ elevation. Idle. Derbec Blue Gravel Mining Co., of San Francisco, owner.

*Diamond Creek Consolidated* (*Eagle Bird*) *Mine* (Quartz).—See our VIth (Part II), Xth, and XIIth Reports, pp. 51, 389, and 188. It is at Maybert, at 3,000′ elevation. Since our last Report the main shaft has been sunk 100′ farther, and a new hoist, compressor, and 30 stamps and 4 Johnston concentrators erected. The mine is not working; only the water is being kept out and the sawmill running, employing 6 men. Diamond Creek Consolidated Gold and Silver Mining Co., of Kansas City, Mo., owner; C. A. Lilly, of Maybert, manager.

*Diamond Mine* (Quartz).—See our XIIth Report, p. 188. It is 2 miles S. of Grass Valley, at 2,400′ elevation, and comprises 69.72 acres under agricultural patent. The vein strikes N., and dips 38° E., in a syenite formation, and is from 18″ to 3′ wide. There is a 90′ perpendicular shaft turned to an incline for 70′ farther, to reach the vein in the hanging-wall, which is here 3′ wide. Idle. H. G. Leman, of Grass Valley, owner.

*Diamond* (*Pacific*) *Mine* (Quartz).—It is near Meadow Lake, at 7,200′ elevation. The vein, averaging 6′ in width, courses N.W., and dips 45° S.E., between syenite walls. There is a double-compartment shaft, at present filled with water, said to be several hundred feet deep, and several open cuts on the outcrop of the vein. Two men are at work. W. H. Leman and J. Williams, of Cisco, owners.

*Dillon Mine* (Quartz).—It is 1 mile S.E. of Graniteville, at 5,100′ elevation, and comprises two claims. There are several veins running through the property with a general N.W. strike, approaching each other going S.; their dip is from 65° to 75° W., in granite near the contact of slate, and they vary in width from seams to several feet. The mine is opened by a 60′ tunnel on one of the veins, thence a 204′ crosscut through two other veins, while those farther south were not reached. A 105′ air-shaft ventilates the tunnel. The first vein has been stoped 75′ from the surface. A 72′ winze below the tunnel shows a 2½′ vein in the bottom. A 4-stamp water-power mill, with 650-lb. stamps, crushes 8 tons in twenty-four hours. The property is not worked during the winter. Seven men are employed during the summer. Foley & Hibbard, of Eureka, owners.

*Eagle Echo Mine* (Drift).—It is on Relief Hill, at 2,700′ elevation, and comprises 15 acres of the Eureka Lake Co.'s ground. There is a 70′ perpendicular shaft leading to a drift 3,700′ in length, with an incline at the end; the gravel is raised up the incline with a whip. The gravel is loose, and is breasted out 6′ high, 65′ wide, and timbered with post and cap, lagging up the roof. Six men are breasting, taking out, per day, 36 to 45 carloads of 2,500 lbs. The dump holds 100 loads, and is washed every day, through 18″ flumes set on a 1″ to 1′ grade, lined with 6″ blocks, 17″

square. The tailings dump into Logan Cañon. For six months free wash-water is obtained from neighboring cañons; the remainder of the season 200 miner's inches are obtained from the Bloomfield ditch, for one hour per day. Sixteen men are employed. Eureka Lake Co., of San Francisco, owner; R. H. Penrose, of Relief Hill, lessee and manager.

*Eagle Bird Mine* (Quartz).—See Diamond Creek Cons.

*Echo Mine* (Drift).—See Eagle.

*Electrical Mining Co.'s Green Mountain, Sanders, and Redan Mines* (Quartz).—They are on Osborne Hill, 3 miles S. of Grass Valley, at 2,780′ elevation, and comprise 3,000′ by 600′. The vein strikes N.W., and dips 38° W., in diorite. The main incline, 600′ deep, is being pumped out. The plant consists of a steam hoist and pumps and a 20-stamp steam-power mill, with 1,000-lb. stamps, and 8 Frue vanners. Two men are employed. Electrical Mining Co., of San José, owner; D. Coughlin, of Grass Valley, superintendent.

*Empire* (*Ophir*) *Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 426, 371, 272, and 189. It is 1 mile E. of Grass Valley, at 2,650′ elevation, and comprises six claims with several veins; the principal ones are the *Ophir* and the *Rich Hill* vein, which is about 15″ in width, strikes N.W. and S.E., and dips 30° S.W., between a diabase foot-wall and a diorite hanging-wall. The main working shaft has reached a depth of 2,100′ on the incline, and drifts extend over 2,000′ from it. Two pay-shoots, pitching S.E., have been worked to over 1,800′ in length on the Ophir, and a shorter distance on the Rich Hill. The entire works are driven by water, under 420′ head, derived from the Grass Valley Water Co., with auxiliary steam for the pumps in case of accident to the water supply. Two Rand drills are used, the compressor only running one side. The 40-stamp mill, with 850-lb. stamps, is equipped with 16 Triumph vanners, and 42 tons of high-grade sulphurets per month are produced and sold in open market. One hundred and forty-five men, including tributers, are employed. R. Walker, of Grass Valley, superintendent.

*English Co.'s* (*Badger Hill*) *Mine* (Quartz).—See our XIIth Report, p. 185. It is 1 mile S.E. of Cherokee. Badger Hill Mining Co., of North San Juan, owner.

*English Mountain Gold Mining Co.'s Mine* (Quartz).—It is 20 miles W. of Emigrant Gap, at 8,000′ elevation, and comprises three full claims. The 6′ vein strikes N. and S., and dips 75° W., in syenite. The ore carries 1½% of sulphurets of low grade. The mine is opened through three tunnels, giving from 80′ to 300′ of backs; the ground between Nos. 1 and 2 is stoped out; No. 3, now 1,150′ long, is being driven ahead. There is a Hallidie rope tramway, 2,000′ long on 33° grade, down to the mill, and has a capacity of 200 tons in ten hours. The 20-stamp steam-power mill has 1,000-lb. stamps run at 84 drops per minute, crushing 40 tons per day, with a consumption of 3¼ cords of wood per day. Forty-five men are employed. F. L. Underwood, of New York, owner; C. H. Mallen, of Nevada City, superintendent.

*Ethel Mine* (Quartz).—See our XIIth Report, p. 189. It is between Bear and Yuba rivers, 2½ miles N. from Emigrant Gap, at 4,975′ elevation. The vein, 18″ to 30″ wide, strikes N. and S., and dips 37° E., between grano-diorite walls. It is opened through a 4½′x 10′ incline, 80′ deep, furnished with a patent horse-whim. At the bottom of the incline drifts have been turned 50′ N. and 55′ S. The quartz is somewhat

glassy, and is stated to carry 2½% of sulphurets. Six men are employed. The property is leased to W. W. Mendenhall, of San Francisco. South Yuba Ditch Co., owner.

*Excelsior Mine* (Quartz).—It is ½ mile W. of Meadow Lake, at 7,100′ elevation. The vein, of great prominence and width of outcrop, exceeding 45′ in places, courses N.W. and S.E., and has been worked in numerous places along the outcrop, the ore being crushed in the 10-stamp steam-power mill. Idle at present. Mrs. H. Hartly, of Carson, Nev., owner.

*Federal Loan Mine* (Quartz).—See our XIth and XIIth Reports, pp. 290 and 189. It is on Deer Creek, 4 miles E. from Nevada City, at 2,760′ elevation. Since our last Report the main shaft has been lowered from the 500′ to the 800′ level, where the vein shows only stringers of quartz, rich in free gold. A 300′ drift extends E. from the 500′ level, and also one at the sixth, and a 700′ drift on the seventh station, below which a 40′ winze has been sunk, tapping the top of a new ore-shoot which is to be opened by the present eighth level, which is now 300′ long. The machine plant has been increased by an Ingersoll compressor for five drills, driven by a 4′ Pelton wheel, under 350′ pressure. New 6″ and 8″ pumps and a No. 3 blower to aid the ventilation, have been added in the shaft, and a 6′ improved Triumph vanner and canvas tables to the mill. The mill is idle, and awaits the completion of No. 8 level to the new ore-shoot. Both quartz and its 4% sulphurets are high-grade. Water is obtained from the South Yuba ditch for five Pelton wheels, requiring 35 miner's inches. Twelve men are employed. An incorporated company, of Nevada City, owner; J. O. Neal, secretary; J. Vincent, of Nevada City, superintendent.

*Fisk* (*Ogdensburg and St. Lawrence*) *Mine* (Drift).—It is 9 miles N. from Emigrant Gap, at 5,850′ elevation, and comprises 140 acres. This is on what is supposed to be the Omega channel, coming through the Gold Lake country of Sierra County. The general course is N.E., and the gravel is from 1′ to 23′ in thickness, with some cement capping. The channel appears to fork on this ground or else to form a horseshoe, and the tunnel, 130′ long, cuts diagonally across the front portion, and is to be continued to the back part, about 75′ ahead. Breasting on the tunnel level is carried 8′ wide and 6′ high, and the gold found is of a heavy, nuggety character. During the summer months surface gravel is washed through a 16″x 18″ flume, 150′ long, set on a 10″ grade, and paved with pole and Hungarian riffles, with 150 miner's inches of free water from Nagle and Mooney creeks. The tailings dump into Mooney Creek. The surface workings have a bank 18′ high and 200′ long. Three men are at work. — Fisk et al., of Washington, Nevada County, owners.

*Forest Mine* (Quartz).—It is 3 miles from Nevada City, at 2,450′ elevation. The 6″ to 2′ vein strikes E. and W., and dips nearly vertically, between slate and grano-diorite. The quartz horns well in free gold, and carries considerable sulphurets. Mining is carried on through a 4′x 4½′ incline, which is being sunk 150′, and is now 30′ deep. The hoist and 7″ pump are run by water-power, using a 6′ Pelton wheel for the hoist and a 9′ one for the pump. The water, amounting to 10 miner's inches, is free, and obtained from Ragon Flat. Four men are at work. W. Green and R. Hughes, of Nevada City, owners.

*Forest Springs Quartz Mining and Lumber Co.'s Mine* (Quartz).—See Norambagna.

*Forlorn Hope Mine* (Quartz).—It is on the banks of Deer Creek 2½ miles N. from Rough and Ready, at 1,580′ elevation, and comprises 3,000′ by 600′. The 18″ to 24″ vein strikes N. 8° E., and dips 30° W. in grano-diorite. Three tunnels have been driven on the vein: No. 3 starting near the creek, is between 400′ and 500′ long, intersecting, at 225′ from its mouth, a 5′x 9′ incline shaft, which extends 200′ below the tunnel on the slope of, and showing a good vein in the bottom. The collar of the shaft is 100′ above the tunnel level on the slope. Tunnel No. 2 is 35′ perpendicularly above No. 3, and extends 325′ along the vein. Near the end of the tunnel a vein, striking N.E., and 4′ wide cuts through the N. vein, with 25° dip. The shaft is provided with a hoist and a 6″ pump, run by water-power, derived from the Excelsior ditch. An old 5-stamp mill, with 750-lb. stamps, run by water, stands below No. 3 tunnel. One man is at work. An incorporated company, of Smartsville, owner; J. Driscoll, secretary; W. W. Chamberlain, of Smartsville, manager.

*Fountain Head Mine* (Drift).—It is 3 miles N.E. from Nevada City, at 2,650′ elevation, and comprises 373 acres of patented ground, extending 1 mile along Washington Ridge. There is an incline 100′ deep, which will have to be extended 340′ to reach the bedrock of the channel. There is a 6″ pump and a hoist driven by water-power. Idle. Fountain Head Gravel Mining Co., owner.

*Friendly Peace Mine* (Quartz).—It is a prospect, 1 mile N.E. from Maybert, at 3,450′ elevation. The 2′ to 3′ vein strikes W. of N., and dips 60° E. A drift has been started on the vein, and is 25′ long. One man is at work. H. W. Cole, of Maybert, owner.

*Gambrinus Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 451 and 189. It is on Mill Ravine, 5 miles W. from Washington, at 5,070′ elevation. Idle. J. McBean et al., of Washington, owners.

*Georgia Mine* (Placer).—It is 1½ miles E. of Eureka, in Sec. 10, T. 18 N., R. 11 E., on South Fork Creek, at 5,400′ elevation, and comprises 20 acres. The gravel is 2′ deep, carrying large bowlders, and contains coarse gold. The water season lasts three months. One man is at work. G. O. Rooker, of Eureka, owner.

*German Mine* (Quartz).—It is 3½ miles E. of Washington, at 2,800′ elevation, and comprises two quartz claims, 80 acres of placer, and 160 acres of agricultural ground. There are two parallel veins which strike N. and S., and dip 15° E.; the main vein is from 4′ to 5′ wide, between a slate hanging-wall and a diorite foot-wall. It opened through two tunnels; the lower one is 800′ and the upper one 250′ long. Very little stoping has been done. On the pay-shoot the quartz shows coarse free gold. Below the tunnels is a 10-stamp water-power mill, with a chute from the tunnel for conveying the ore. The stamps weigh 1,000 lbs., and the mill is run at a speed of 80 drops per minute of 5″ drop and 6″ discharge, using No. 35 brass wire screen, and with a capacity of 20 tons per day. The apron-plates are set on a grade of 1½″ to 1′. There are four sections, each 12′ in length, of the canvas plant, but no concentrators. The water-power is taken from Cañon Creek, through 2 miles of ditch of 350 miner's inches capacity, delivered through 2,000′ of 11″ and 8″ pipe to a 4′ Dodd wheel, under 206′ pressure. Ten men are employed. An incorporated company, of Shasta County, owner; D. Harmon, of Nevada City, manager.

*Giant King Mine* (Quartz).—It is 1½ miles S. of Washington, at 3,100′ elevation, and comprises three claims. The strike is N. 60° W., and dip 50° E., between slate and porphyry walls. There are two tunnels: No. 1, which is 100′ vertically below the outcrop, cross-cuts 180′ to and 74′ through the vein; No. 2, at a vertical depth of 254′, cross-cuts 486′ to the vein and is continued across it. The quartz carries from 1% to 3% of sulphurets, mostly iron and lead. Two men are at work. W. L. Williamson and M. N. Cole, of Washington, owners.

*Glencoe Mine* (Quartz).—It is 2 miles S.E. from Nevada City, adjoining the Banner Mine on the south, at 2,600′ elevation, and comprises 3,000′ by 600′. The vein strikes E. and W., and dips nearly vertically in slate, about 300′ from the contact. It is from 3′ to 11′ in width, heavily mineralized, and said to contain 5% sulphurets. It is worked through tunnels and a shaft, the latter 150′ deep, and will ultimately connect with the former. The two tunnels are run 600′ on the vein. Two men are at work. Nevers & Sharpe, of Nevada City, owners.

*Glenn Mine* (Quartz).—It is 1¼ miles S.E. of Eureka, at 4,950′ elevation, and comprises four claims, known formerly as the *Annie*, *Illinois*, *Russell Ravine*, and *Stacey*. The veins strike N. and S., and dip from 50° to 70° E., with respective widths of 3′, 2′, 2′, and 2′, all in granite in proximity to the slate. The Stacey claim has a tunnel 1,200′ long, which likewise cuts the Illinois. There are two ore-shoots on the Stacey, 260′ and 150′ long, and one on the Illinois, 200′ in length. The two veins are about 100′ apart, and the tunnel gives 250′ of backs. On the north shoot of the Stacey is a double-compartment shaft, which has a depth of 300′ below the tunnel level. The Russell Ravine claim has been leased to other parties. Two men are at work. F. M. Carter and C. D. Eastman, of Eureka, owners.

*Gold Bank Tunnel Company.*—This is a corporation formed to run a drain tunnel from Jones' Bar, on the South Yuba River, 4½ miles S. from Grass Valley. It is to run 4½ miles N.E., and then to turn south. Preliminary work has been performed for the purpose of locating the line of the main tunnel. It has been figured that 66,000,000 tons of ore will be available above the tunnel level. Gold Bank Tunnel Co., owner; G. E. Johnson, of Nevada City, secretary; F. Burns, of Nevada City, manager.

*Gold Flat Mine* (Quartz).—See Mohican.

*Gold Flat* (*Potosi*) *Mine* (Quartz).—See our XIIth Report, p. 189. It is 1 mile S. from Nevada City, at 2,650′ elevation, and comprises 2,870′ by 400′ at one end, and 600′ at the other end line, in Secs. 24 and 13, T. 16 N., R. 8 E. Idle. An incorporated company, of Grass Valley, owner; J. Skewes, of Grass Valley, superintendent.

*Gold Hill* (*Nevada City*) *Mine* (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 49, 418, 378, 288, and 190. It is situated on the southwest edge of Nevada City, at 2,450′ elevation. Electrical power is being introduced at the mine, preparatory to pumping it out. Twelve men are at work. An incorporated company, of San Francisco, owner; F. Dawson, of Grass Valley, superintendent.

*Gold Point Mine* (Quartz).—It is 2 miles E. of Grass Valley, at 2,630′ elevation, and comprises 3,000′ by 600′ of patented ground. There are two parallel veins on the property 70′ apart, with a N. 34° W. strike and 75° S.W. dip. A tunnel runs from Little Wolf Creek 600′ to the vein, and then turns on the vein, passing through 400′ of a pay-shoot, expos-

ing a 3′ vein. A two-compartment shaft has been sunk 170′ to the tunnel level with a steel horse-whim. There is a 10-stamp water-power mill, with 1,000-lb. stamps, and two Hendy-Norbaum concentrators. Power is taken from the Empire pipe. Idle. An incorporated company of Grass Valley, owner.

*Gold Tunnel Company* (Quartz).—It adjoins the Mountaineer Mine ½ mile W. from Nevada City, at 2,340′ elevation, and comprises 3,200′ by 600′. The vein strikes N. 8° E., and dips 30° E., with an average width of 12″ in granite. Three tunnels have been opened from Deer Creek, and two small shafts sunk on the summit of Lost Hill. The main tunnel is 200′ long; the other lower tunnels have had to be abandoned for the present. About 700′ from the tunnel mouth the vein shows a split, one branch diverging from the true course to the N.E., but uniting again 200′ beyond. The ore above water-level is high-grade where it contains ochre. The old workings of this mine, now inaccessible, reached to a depth of 720′ on the slope of the vein, and are said to have been very productive. The ore is crushed in the Nevada County Co.'s mill. Four men are employed. A. D. Allen, of Nevada City, owner; S. Butler et al., of Nevada City, lessees.

*Golden Chain Mine* (Quartz).—See Syndicate.

*Goodall Consolidated Gold Mine* (Quartz).—It is in Sec. 1, T. 15 N., R. 8 E., 3½ miles S.E. from Grass Valley, at 2,600′ elevation, and comprises six locations, five of which are full claims, and one 1,100′ by 600′; they are the *Congo*, *Goodall*, *Gov. Perkins*, *Manhattan*, *Oro Fino*, and *South End*. Various prospect shafts and tunnels have been run at different points. The South End claim has three parallel veins about 150′ apart which strike N. and S., and dip about 40° W. The two most easterly veins have been worked by two tunnels, one of which has been run 500′ on the vein, 100′ from the surface; the other tunnel, 250′ long on the vein, gives 60′ of backs. The ground above these tunnels is stoped. These veins are along the diorite and slate contact, and show in the tunnels an average width of 2′. Idle. An incorporated company, owner; W. Berry, of Grass Valley, manager.

*Gov. Perkins Mine* (Quartz).—See Goodall Consolidated.

*Grant and Canada Hill Mining Co.'s Mine* (Quartz).—See our XIIth Report, p. 190. It is 2½ miles N.E. of Nevada City. Idle. W. Veal, of Nevada City, lessee.

*Granite Hill Mining and Development Co.'s Mine* (Quartz).—It is 1 mile S. of Grass Valley, at 2,250′ elevation, and comprises 3,000′ by 600′. The vein courses a little E. of N., and dips W., varying from 25° to 50°, next to a rolling foot-wall. The formation is diorite; the vein, running into grano-diorite, varies from 3″ to 2½′ in width, and is said to carry as high as 6% of high-grade sulphurets with spar. It is opened by a 5′x 12′ three-compartment incline, 600′ deep, with levels of 200′ to 300′ long, both N. and S., at every 100′. The pay-shoot, from 50′ to 70′ long, pitches S., and is being stoped between the third and fifth levels. The hoist, pumps, and mill are run by water-power from Wolf Creek, through ¾ mile of ditch. There are 10″, 8″, and 7″ pumps. The mill has 5 stamps of 850 lbs. each, and is run by a 6′ Pelton wheel under 60′ head; it is furnished with a Woodbury concentrator. Thirty-three men are employed. An incorporated company, of Sacramento, owner; T. F. Phillips, of Grass Valley, superintendent.

*Grass Valley Tunnel Co.*—See Treadwell Tunnel Co.

*Gray Eagle* (*Dutch Flat, Sunny South*) *Mine* (Quartz).—It is 10 miles N.E. from Cisco, at 6,825′ elevation. The vein is 15′ wide, strikes N.W. and S.E., and dips 55° S.W., between granite walls. There are two open cuts, 60′ in length, along the outcrop. Two men are employed. R. A. Campbell, of No. 1014 Sixteenth Street, Oakland, owner.

*Great Britain Mine* (Quartz).—See Massachusetts Hill.

*Great Eastern Mine* (Quartz).—See Syndicate.

*Green Mountain Mine* (Quartz).—See Electrical Mining Co.

*Greystone Mine* (Quartz).—It is 5 miles S.W. from Graniteville, at 4,000′ elevation. The vein has a S.E. course with N.E. dip, between serpentine and slate, in an altered contact rock, from 30′ to 60′ wide, which contains pockets of gold. There is a 200′ open cut and a 40′ tunnel. Two men are at work. J. Bander et al., of Moore's Flat, owners.

*Grub Stake* (*California*) *Mine* (Quartz).—It is at Meadow Lake, at 7,225′ elevation. The vein, 8′ to 45′ in width, courses E. and W., and dips 50° N., between syenite and diorite porphyritic walls, and carries a heavy percentage of sulphurets. There is a three-compartment shaft, now caved, said to be 150′ deep, besides several extensive open cuts along the outcrop. There are on the property a "pulverizer" and several pans, run by steam-power; also a small furnace. Idle. F. Cook and J. P. Clarke, of Cisco, owners.

*Harmony Mine* (Drift).—See our XIth and XIIth Reports, pp. 298 and 190. It is 2½ miles N.E. of Nevada City, at 2,800′ elevation, and comprises 3,000′ along the Harmony channel. The general course of the channel is E. and W., with a 2.3% grade, and 175′ in width of paying ground. The western half of the ground has been worked, leaving 1,600′ unworked on the east end. The gravel, which is more or less cemented, carries considerable quartz, from a quartz vein passing across the east end of the ground at the contact crossing. The present works are carried on through a 5′x 12′ double-compartment incline, 360′ deep on a 30° grade, equal to 170′ perpendicular depth. The main gangway driven up the channel is carried 6½′ high, 9½′ in bottom in swelling granite bedrock, and is timbered with green-peeled cedar poles, with spruce caps 4½′ long. A spruce set costs $3 50, while with cedar posts the cost is $1 50 per set. The breasts are carried 4′ high and 60′ wide, taking up from 4″ to 6″ of the bedrock. For timbering in the breasts, green-cedar cordwood, split thick, costing $3 50 per cord, is used. The gravel for 18″ next the bedrock contains 50% cobbles and bowlders, while the upper portion contains a certain amount of clay. Sixty-five tons of gravel are taken out per shift by 7 breasters, besides hoisting 40 cars of waste per day. The carmen travel 26 miles per day. In the 175′ width of pay-gravel in the channel runs a serpentine streak of pay of much higher grade than the general average of the channel; thus, while a cross-section of the 175′ is said to yield $1 25 to $2 50 per ton, portions of the channel yield $4 per ton. The gravel when hoisted is trammed to the mill and delivered on grizzlies, with 4″ spaces, dropping into a bin of 250 tons capacity, from where it descends by gravity to the self-feeders. The mill has 10 stamps of 850 lbs. weight, dropping 104 times per minute, with 6″ drop and low discharge, using tin screens, with 12 holes to the linear inch, crushing 120 tons per day, according to the company's statement. An apron-plate 4′ in length is followed by one 3′ in length, with a drop between, and succeeded by 25′ of 14″ sluices furnished with slat riffles. The cost of milling is stated at 13 cents per

ton, or for mining and milling 90 cents per ton. The mill is run by a 5′ Pelton wheel under 350′ head, using 10 miner's inches of water. For the hoist and pump a 25 H.P. steam-engine is provided, for cases of emergency. Fifty-six men are employed. Harmony Gold Gravel Mining Co., of Nevada City, owner; K. Casper, secretary; J. C. Hothersoll, of Nevada City, superintendent.

*Hartery Consolidated Mining Co.'s Mine* (Quartz).—It is ½ mile N. of the Allison Ranch Mine, on the west bank of Wolf Creek, at 2,360′ elevation, 2½ miles S. of Grass Valley. An incorporated company, of Grass Valley, owner.

*Henrietta Mine* (Quartz).—It is 4 miles N.E. of Cisco, at 7,000′ elevation. The vein, 4′ wide, strikes N.E. and S.W., and dips nearly vertically, between syenite and mica-schist walls. It is a prospect, with an opening 20′ deep on the vein. The ore is crushed by rollers, and washed through a rocker and a short line of sluices. Three men are at work. H. Smith, A. Ashley, et al., of Cisco, owners.

*Hirschman Mine* (Drift).—See Murphy and Grover.

*Holbrooke Mine* (Drift).—It is 3 miles W. of Grass Valley, at 2,700′ elevation, and comprises 33 acres on the Alta Hill channel. The mine is worked through a double-compartment incline 168′ deep, and a gangway 115′ long; it will require 25′ more to reach the channel. Steam hoist and pumps are in use. Idle. E. E. Holbrooke, of Grass Valley, owner.

*Home Mine* (Quartz).—See our XIIth Report, p. 190. It is on Deer Creek, 1½ miles W. from Nevada City, at 2,400′ elevation, and comprises 28 acres. The vein strikes N. 30° W., with a dip W., in slate bedrock. Going north the vein is replaced by a number of veins and veinlets making into the foot-wall. A 5′x 9′ incline has reached 320′ in depth, and will be continued to the 400′ level. A drift on the 200′ level extends 500′ N., and a 400′ cross-cut has been extended into the foot-wall. A 10″ pump, making four 5′ strokes per minute, and the hoists, are operated by 4′ Pelton wheels, working under 200′ pressure, with water from the Excelsior Co.'s ditch. Eight men are employed. An incorporated company, of San Francisco, owner; O. E. Johnson, of No. 316 Front Street, secretary; C. Kahl, of Nevada City, superintendent.

*Idaho Mine* (Quartz).—See Maryland.

*Illinois Mine* (Quartz).—See Glenn.

*Independence Mine* (Quartz).—See Lone Star.

*Independence Mine* (Quartz).—It is 2½ miles E. of Grass Valley, at 2,700′ elevation, and is an extension of the Maryland Mine. The vein strikes E. and W., and dips nearly vertically. A 4′x 9′ double-compartment shaft, being sunk to strike the extension of the Idaho-Maryland pay-shoot, has attained a depth of 800′, and is being continued. A cross-cut is being started at this depth to cut the vein. The plant comprises a hoist, and two 6″ plunger pumps, making six 6′ strokes per minute, and driven by a 5′ Pelton wheel, taking water from the Empire pipe-line, under 300′ pressure, through 1,100′ of 9″ pipe. The 1″ nozzles are furnished with Chavanne's patented regulator. (See Bulletin No. 9, Mine Drainage.) Ten men are employed. A. Chavanne and D. Frick, of Grass Valley, owners.

*Jack Rabbit Mill and Mining Co.'s Mine* (Quartz).—See our XIth and XIIth Reports, pp. 278 and 190. It is 4 miles E. of Grass Valley. Idle.

*Jesse Consolidated* (*Constitution, Cyane, or Mammoth*) *Mine* (Quartz).—It is 3 miles E. of Nevada City, at 2,600′ elevation, and comprises what was formerly three separate mines on the east side of the "contact" belt. On the Constitution and Mammoth are two parallel E. and W. veins, 2′ and 20′ wide. On the Cyane is a vein, 2′ to 3′ wide, coursing N.E. and S.W., and upon which is an 80′ shaft. Very little work has been done on them so far. P. Thautphaus, of San Francisco, owner.

*Joseph Warren Mine* (Quartz).—It is 1¼ miles N.E. from Nevada City, at 2,550′ elevation, and adjoins the Texas. The 3′ vein strikes E. and W., and dips 60° N. in granite. The mine is opened through shaft and tunnel; the former, 30′ deep, with a 20′ drift at the bottom; the latter, 150′ long, has not reached the vein. Two men are at work. J. & S. Jacobs and Erwin Treadwell, of Nevada City, owners.

*Kirkham Mine* (Quartz).—It is 2 miles N.W. from Nevada City, at 2,650′ elevation, and comprises 24.5 acres of patented ground. The vein has a N.E. course, with a W. dip, showing a 3′ vein in granite; the quartz contains about ½% of sulphurets. The developments are carried on through a 128′ cross-cut to the vein, on which 160′ have been drifted. A second tunnel, 112′ below, has been started. One man at work. T. P. Kirkham, of Nevada City, owner.

*Knickerbocker Mine* (Drift).—See our XIIth Report, p. 191. It is in Secs. 1 and 2, T. 16 N., R. 8 E., on Cement Hill, 1 mile N.W. from Nevada City, at 2,680′ elevation, and comprises 370 acres of ground. No systematic work is being done; a short prospect drift is being run from the main drift to the south on bedrock gravel, claimed to be a break from the main channel. Four men are at work. L. D. Craig et al., of San Francisco, owners.

*La Belle Mine* (Quartz).—It is 3¼ miles E. of Nevada City, at 2,625′ elevation. The vein strikes N. 72° 30′ W., and dips 30° N., crossing the contact with a vein 5″ to 2½′ wide. The quartz is said to carry 1% of iron, zinc, and lead sulphurets. The work consists of 128′ cross-cut to the vein and 250′ of drifts, one being 200′ E. and the other 56′ W., showing a 17″ vein in the face. This drift gives 600′ of backs on the slope of the vein. Only about 100 tons have been stoped. Water-power is available, and but little timbering required. The mine makes about 3 miner's inches of water. Five men are at work. J. J. Lyons and L. Postelwaite, of Nevada City, owners.

*La Grande Mine* (Quartz).—It is 5 miles N.E. from Washington, at 4,625′ elevation, and comprises two full claims. The vein, which has a very prominent outcrop, strikes N., dips E. in slate, and shows a width of 3′ on an average. Two shallow shafts, 30′ and 20′ deep, have been started on the outcrop, and a cross-cut, at present 60′ long, will require extending 200′ to reach the vein, 80′ below the shaft. Three men are at work. W. H. Meade, of Washington, owner.

*La Marque Mine* (Quartz).—It is 2 miles S. from Grass Valley, at 2,600′ elevation, and comprises 3,700′ by 600′. The vein strikes N. and S., and dips 18° W., between slate walls 10″ apart. The quartz carries high-grade sulphurets. The work is carried on through an incline 325′ deep, from the bottom of which drifts have been started both ways, being about 100′ in length. Ten men are employed. An incorporated company, of Grass Valley, owner; J. Mulroy, secretary; A. Maltman, of Grass Valley, superintendent.

*Last Chance and Pinney Mine* (Quartz).—It is 2 miles S. of Maybert, at 5,400′ elevation, and comprises two full claims. The vein strikes N. and dips 56° E.; it is narrow, but carries a high grade of rock. A cross-cut has been driven 150′ to the vein. A small 5-stamp mill, with 750-lb. stamps, is driven by steam-power. Four men are at work. Parsons, West & Fowler, of Maybert, owners.

*Lindsay Mine* (Quartz).—It is 5 miles N.E. from Washington, at 5,400′ elevation, and comprises two claims with parallel veins, known as the *Big* and *Little Lindsay*. The 5′ vein strikes a little W. of N., and dips E., in protogene. The mine is being reopened through a tunnel that will strike the vein 200′ below all the old workings. Greathouse, Robertson & Bell, owners; — Tully, of Maybert, superintendent.

*Live Oak and Minuet Mine* (Quartz).—See our XIIth Report, p. 191. It is on Grizzly Ridge, 2½ miles N. from Columbia Hill, at about 2,600′ elevation. McMahon & Jennings, of Columbia Hill, owners.

*Lone Ridge Mine* (Quartz).—It is 5½ miles N.W. from Nevada City, at 2,800′ elevation. Of the three parallel veins striking N.E., the principal one dips 30° N.W., between slate and diorite walls, varying in width. The three veins dip toward each other, the foot-wall vein being the flattest. The quartz carries ochery material, and is said to mill high; the ore-shoots are narrow, not over 50′ across. There are two incline shafts, 50′ and 25′ deep, respectively, and a 30′ drift. The ore is reduced in an 8′ arrastra run by a hurdy wheel, under 80′ head, using free water from an old tunnel. Two men are at work. Kirkham Brothers, of Nevada City, owners.

*Lone Star (Murchie) Mine* (Quartz and Hydraulic).—It is 1½ miles E. from Nevada City, at 2,750′ elevation, and comprises 359 acres. There are two systems of veins on the property, striking N.-S. and E.-W.; the latter dip 65° N. and cross the former, which have a flat dip to the west. They are all in granite. The old works were chiefly on the *Big Blue* vein, which is the strongest vein in the group, but of low grade, the incline being 700′ long; some work was also done on the *Independence*, a N. and S. vein. The present works are on the *Coe* vein, south of the Big Blue, through a tunnel 800′ in length, which crosses the Big Blue. Belonging to the property is an 8-stamp mill on Deer Creek, ¼ mile distant, with 900-lb. stamps driven by a 6′ Pelton wheel, under 41′ pressure, with water from a ditch ¾ mile long, diverting 300 miner's inches from Deer Creek. The mill is idle. Five men are employed. An incorporated company, of San Francisco, owner; A. W. Blundell, of Nevada City, secretary and superintendent.

*Lupine Mine* (Drift).—See our XIIth Report, p. 191. It is 11 miles N.E. from Nevada City, in Sec. 21, T. 16 N., R. 9 E., at 3,800′ elevation, and comprises 320 acres. At present three men are drifting into the main ridge to strike the main channel. Judge Caldwell et al., of Nevada City, owners.

*Malony & Fouch Mine* (Quartz).—It is 6 miles S.E. from Graniteville, at 5,000′ elevation. The vein strikes N.E., and dips 45° E., in a slate formation, with a width of 8′ to 10′. It is in the nature of a porphyry, and it is said to carry 2½% of high-grade sulphurets. The developments consist of a tunnel 20′ long, giving 30′ of backs and 15′ wide at the breast. A 2-stamp prospecting mill has 110-lb. stamps, with a capacity of 1 ton per day, run by free water obtained from Poorman's Creek, through a ditch 1 mile long, with a capacity of 100 miner's inches, deliv-

ring the water under 200′ head. Two men are employed. C. Malony and — Fouch, of Graniteville, owners.

*Mammoth Mine* (Quartz).—See Jesse Consolidated.

*Manhattan Mine* (Quartz).—See Goodall Consolidated.

*Manzanita Mine* (Drift).—See our VIIIth, XIth, and XIIth Reports, pp. 458, 302, and 191.. It is ½ mile N. of Nevada City, at 2,500′ elevation, and comprises 206 acres of patented ground. The company own two water-rights; the Manzanita ditch takes water from Slate Creek; and the Deer Creek ditch, with a capacity of 1,000 miner's inches, takes water from near Scott's Flat through 7 miles of ditch. Idle. Manzanita Gravel Mining Co., of Nevada City, owner; B. F. Snell, secretary; E. A. Tompkins, of Nevada City, superintendent.

*Mary Jane Mine* (Drift).—It is 10 miles N. of Emigrant Gap, at 5,975′ elevation, and comprises 100 acres on an ancient channel, supposed to be identical with the Omega. The main tunnel is 700′ long, and a 12′ upraise is made into the gravel; the gravel gangway is 230′ long, and the breasts are carried 5′ high and 40′ wide, and timbered with post and cap. Each man extracts 8 cars, of 1,200 lbs. each, daily. The gold is coarse. Wash-water is obtained from Boney Creek and dropped into a reservoir; the gravel is washed four times per day through a 12″ flume set on 6″ grade. Seven men are employed. — Hyatt, E. H. Whelan, et al., of Emigrant Gap, owners.

*Maryland-Idaho Mine* (Quartz).—See our VIth (Part II), VIIIth, Xth, XIth, and XIIth Reports, pp. 45, 425, 372, 271, and 192. It is about 1 mile N.E. from Grass Valley, at 2,525′ elevation. At present they are sinking a winze below the 1,600′ level, now 300′ deep, and erecting a compressed-air hoist on it; drifting has been started from the bottom. The 40-stamp mill is crushing 80 tons per day, and using 16 Frue and Triumph concentrators. Everything is driven with water-power, with an auxiliary steam plant in case of necessity. The entire plant is very complete. Electric lights are supplied at hoist, mill, and dump from a 60-light dynamo. The waste car is elevated to the waste-dump tracks, to economize room around the plant. One hundred and forty men are employed. An incorporated company, owner; S. P. Dorsey, of Grass Valley, manager.

*Massachusetts Hill Mine* (Quartz).—It is 1 mile S. from Grass Valley, at 2,375′ elevation, and comprises a number of former mines, including the *Boston Ravine*, *Great Britain*, *New Rocky Bar*, *New York Hill*, *Polkinghorn*, *Rocky Bar*, and *Stockbridge*. These properties will be worked as a unit. A 5′x 16′ three-compartment shaft is being sunk to strike the Breman shaft, which will be enlarged. On this shaft the largest size, double, Rix compound pneumatic hoist has been erected, with 10″ and 14″ Dow pumps with 3′ stroke. The power is obtained from the South Yuba ditch, and is conducted through 7,000′ of 30″ steel pipe to the power-house, situated on Boston Ravine, about 1,000′ from the shaft, where an 18½′ Pelton wheel has been placed, working under a head of 775′, equal to a pressure of 320 lbs. per square inch. The conduit which conveys the water is a continuous riveted pipe, made, at the point of greatest pressure, of No. 5 steel plate, without any allowance for contraction or expansion, capable of resisting any strain that may be brought upon it. The wheel is mounted on a 10″ shaft connecting direct with two compound air-compressors of 10″ and 18″ diameter and 24″ stroke. The air is compressed to 30 lbs., and is con-

ducted through the wheel-pit into a cooler consisting of 50 copper pipe 18′ long and 1″ in diameter, whence it enters the second cylinder and i compressed to 90 lbs. and conducted to the receiver in the shaft-house 820′ distant, through a 6″ pipe, with practically no loss. The air is then raised to a temperature of about 350° by passing it through pipe placed in a furnace so arranged that it has to pass over the heated surface, the volume being increased about 43%. For hoisting purposes i passes into the high-pressure cylinder of a direct-acting Corliss engine after leaving which it passes through a second reheater, and is passed to the low-pressure cylinder of the engine, from which it exhausts into a brick flue that conveys it to the miners' changing-rooms, where it is liberated. The air for the pumps, after reheating, is sent down the shaft through a pipe covered with a non-conductor. The water for power costs 1 cent per 1,000 gals. For a full description of this plant see special article in the back part of this volume. There is a steam plant which can be quickly put in use in case of accident to the water or air plant. Besides the main working shaft, two drain-tunnels are being driven to cut off the surface water. Large and convenient repair shops offices, and changing-rooms for the men have been erected. The entire works will be lighted by electricity, a dynamo for the purpose being placed in the power-house. Forty men are employed at present. An incorporated company, of New York, owner; A. DeWint Foote, of Grass Valley, superintendent.

*Mayflower Mine* (Quartz and Hydraulic).—See our VIIIth, XIth, and XIIth Reports, pp. 453, 295, and 192. It is on Little Deer Creek, 2 miles S.E. from Nevada City, at 2,850′ elevation, and comprises 186 acres. Since our last Report the property has changed hands, and is being worked on a much more extensive scale than heretofore. Of the different veins included in the property, the *Beckman* and *Mayflower* are receiving the principal developments. The former is an E. and W. vein, averaging 18″ in width, with a dip of 25° S. between slate walls following the foldings of the slate. A new 6½′x 14′ incline has been sunk 400′ (on the slope) to the east of the old workings, and a considerable number of drifts have been run, connecting on the west with the former workings, opening up new stoping ground. This incline is provided with double-reel hoist, each drum worked independently by two 8′ Pelton wheels, with 3 nozzles, the gates being operated by hydraulic engines. The pressure is 290′, taking water from South Yuba Ditch Co., through 1,200′ of pipe. The pay-shoot on the Beckman vein has been opened for a continuous length of 1,700′, of which 1,300′ is W. of the shaft and 400′ to the E., where it still continues. The ore from this shoot is stated to carry 3½% of sulphurets of medium grade, consisting of galena, zinc-blende, iron sulphides, and some telluride. The Mayflower vein lies in grano-diorite, between two bodies of slate, and above the Beckman vein. It has been intruded and thrown by a large quartz dike. The Mayflower pay-shoot shows a length of 250′ on one side of the dike and 400′ on the other side, where it still shows in the face. Over 1,500′ of drifts have been run on this vein. The quartz is distinct in its character from the Beckman quartz, carrying fewer sulphurets, and being permeated with chlorite. The former owners took, it is said, extremely high-grade ore from this vein. A drain-tunnel, 700′ long, taps the works 215′ below the surface, measuring on the slope, and discharges into Little Deer Creek. Below this level the works are drained

by an ejector. A new 20-stamp mill, with 900-lb. stamps, steel cams and shoes, and iron dies, is run by water-power, at 96 drops per minute with 5″ drop and 7″ discharge, through No. 1 tin screens. There are front and back plates in the mortars, and in place of aprons, a double line of 2′ plates, 12′ long, set on a 2″ to 1′ grade. There are also 8 Frue concentrators. The ore is passed through the rock-breaker at the shaft before being delivered to the 250-ton ore-bin in the mill. The capacity of the mill is 40 to 45 tons per day, producing 1,500 lbs. of concentrates per day. A compressor in the mill-building runs 5 Burleigh drills, 3 of which only are in use at present. The works are lighted by electricity. The hydraulic ground belonging to the property is not being worked. Fifty-five men are employed. An incorporated company, of No. 532 Market Street, San Francisco, owner; E. A. Davis, of Nevada City, superintendent.

*Merrimac Mine* (Quartz).—See our XIth Report, p. 279. It is in T. 10, R. 8 E., 2 miles N.E. of Grass Valley. Idle. An incorporated company, of San Francisco, owner.

*Metropolitan Mine* (Quartz).—It is 1 mile N. of Moore's Flat, at 3,800′ elevation, and comprises 3,000′ by 600′. The 4′ vein strikes N.W. and S.E., and dips 65° S.W., in a greenstone formation. There are three tunnels running on the vein. No. 1 is 107′, No. 2, 1,040′, and No. 3, 250′ long, with 71′ distance between each of them. Cañons on each side of the claim will furnish free water-power. The ore carries arsenical pyrites, though not of a high grade, but occasional rich pockets are met with.

*Mineral King Mine* (Quartz).—It is 1¼ miles in a N.E. direction from Nevada City, at 2,550′ elevation. The vein strikes E. and W., and dips N., in granite. It adjoins the Texas Mine on the east, and is parallel with the Joseph Warren Mine. It is opened by an 80′ shaft, which will connect with a tunnel from the Joseph Warren Mine. Idle. — Jacobs and Erwin Treadwell, of Nevada City, owners.

*Mistletoe Mine* (Quartz).—See our XIIth Report, p. 193. It is 1 mile N.W. of Rough and Ready, at 1,780′ elevation. The 4½′ vein strikes S. 70° E. and dips 60° N.E. between grano-diorite walls. A 5′x 12′ incline shaft, 60′ deep, is tapped by a drain-tunnel 15′ from the surface. Short drifts have been started. The hoist and pumps are run by steam. Two men are employed. C. J. Graham et al., of Rough and Ready, owners.

*Mohican Mine* (Quartz).—It is 1½ miles S. of Nevada City, at 2,700′ elevation, and comprises two claims, designated the *Gold Flat* and *Mohican*. The vein strikes E. and W., and dips S., from 3′ to 6′ wide, between slate walls. The 4′x 8′ main incline is sunk 150′ on a 36° grade, with levels turned off at 140′; they extend 90′ W. and 80′ E. On the Gold Flat claim is a shaft known as the Mulberry shaft, 100′ deep, sunk 350′ from east end of the claim, with drifts run from the 80′ level for a distance of 50′, showing a 2′ vein in the breast, well mineralized. Idle. An incorporated company, of Grass Valley, owner; J. Skewes, of Grass Valley, superintendent.

*Monarch and Central Pacific Mine* (Quartz).—See our XIIth Report, p. 193. It is 1 mile N. from Rough and Ready, at 1,875′ elevation. The 4′ vein strikes N.W., and dips N.E., in syenite. A 4′x 8′ perpendicular shaft is 57′ deep; 30′ feet below the surface is a drift 35′ long. There is a 10 H.P. steam hoist with a 4″ plunger pump. The Central Pacific has a 37′ vertical shaft on a parallel vein, dipping toward the

latter, and said to carry 10% of sulphurets of high grade; this portio of the property is idle. Three men are employed. An incorporate company, of Oakland, owner; J. Lyons, of Rough and Ready, superir tendent.

*Montana Mine* (Quartz).—It is 3 miles S. from Nevada City, at 3,00( elevation. The vein strikes N.E., and dips 20° N.W. on the slat and granite contact. A double-compartment shaft, 300′ deep, show three quartz stringers in the hanging-wall, 2″, 4″, and 10″ wide, said t carry high-grade sulphurets. A pay-shoot shows on the surface, 20( from the shaft. The hoist and pump are driven by steam-power. Idl J. Garner, of Nevada City, owner.

*Montreal Mine* (Quartz).—See Caledonia.

*Mount Auburn Mine* (Quartz).—It is 1½ miles W. from Nevada City at 2,750′ elevation, and comprises 3,000′ by 600′. The vein strikes N and S., dips 45° E., in granite, and is from 2′ to 5′ wide, with about 1% sulphurets. The 10-stamp mill and hoist have been removed. Idl T. Snell, of New York, and — White, of Grass Valley, owners.

*Mount George Mine* (Quartz).—See our XIIth Report, p. 193. It is miles W. from Nevada City, at 2,800′ elevation, and comprises thre claims. Since our last Report new water-power hoisting works hav been erected, and the main shaft sunk to the 200′ level, whence a drif extends 400′ N., showing from 3′ to 4′ of a vein with 300′ of a pay-shoo of low-grade ore. The small, rich seam back of the main vein has bee followed, with continued good yield. The water-power is obtained fro the Excelsior ditch and is applied, under 85′ pressure, to three Pelto wheels, 5′, 4′, and 14″ in diameter. The 4″ Cornish pump has a 4′ stroke and makes 6 strokes per minute. There is an arrastra for reducing th ore from the rich seam. Six men are employed. F. Zeitler, of Nevad City, and Hon. J. F. Kidder, of Grass Valley, owners.

*Mountaineer Mine* (Quartz).—See our Xth, XIth, and XIIth Re ports, pp. 384, 287, and 193. It is 1 mile W. from Nevada City, a 2,325′ elevation, and comprises 80 acres S. of Deer Creek, besides 1,500 by 60′ on the N., where the works are situated. The *Mountaineer* vei strikes N.E. and dips S.E., with 18″ average width between granit walls. About 150′ E. is a second vein, the *Black Prince*, with simila course and dip and 2′ wide, but of lower grade. On the north side o Deer Creek a drain tunnel, 1,700′ long, follows the Mountaineer vein and, when in 1,000′, taps the main shaft at a depth of 500′ from th surface. This shaft is a 6′x 12′ incline over 800′ deep, with stations a every 100′ down to the 700′ level; the eighth level is 150′ below. There i a 10″ Cornish plunger pump at the 300′ level, run by a 5′ Pelton wheel under 312′ pressure. The vein makes in rolls on the foot-wall, throwin off small veins into the hanging-wall, besides showing two separate quart bodies on the foot and hanging walls, with intervening bodies of granite At the 100′ level N. of the shaft the vein takes a sudden turn to the W. fo about 60′, then curves back to its original course; this curvature is see again at the 300′ and 800′ levels; on the latter it starts 700′ from th shaft. On the 400′ level, S. of the shaft, a quartz feeder makes ove from the Mountaineer to the Black Prince. Four ore-shoots have bee stoped, the longest being 200′; generally they are comparatively short they carry iron and lead sulphurets, and on one shoot some telluride The shaft is being extended another 100′. But little timbering i required. South of the creek a tunnel has been driven on the Blac

Prince, and two tunnels and an upraise on the Mountaineer vein, but the ore was found to be low grade. The water-power mill has 15 stamps, with frame for 20, and 10 only are dropping, on tributers' rock; there are also 6 Frue vanners, 4 of which are running. The ore is said to carry 1½% of sulphurets. The water is obtained from the South Yuba Ditch Co., through ½ mile of pipe, under 312′ pressure. Thirty men are employed. An incorporated company, of San José, owner; W. A. Dennis, of Nevada City, superintendent.

*Mountain View Mine* (Quartz).—It is on Cañon Creek, 7 miles E. of Washington, at 4,000′ elevation, and comprises 3,000′ by 600′. The vein strikes N. and S., and dips 50° E., and is from 2′ to 4′ wide, between granite walls. The quartz is said to carry 1% of good grade sulphurets. The developments comprise a 150′ tunnel on the vein, with an 85′ upraise to the surface, and a 20′ winze below the tunnel, showing the vein 4′ wide. There is a 3-stamp water-power mill with 1,000-lb. stamps, run at 96 drops of 6″, with 6½″ discharge through No. 40 screens, and crushing 2½ tons daily per stamp. The water-power is derived from Cañon Creek, through a short ditch of 250 miner's inches capacity, delivered on a 5′ Pelton wheel under 33′ pressure, using 140 miner's inches. The property is idle. C. O. Anderson et al., of Nevada City, owners.

*Mount Vernon Mine* (Quartz).—See Oro Grande.

*Müller & Walling Mine* (Quartz).—See our XIth and XIIth Reports, pp. 296 and 194. It is in Woods Ravine, 1¼ miles W. of Nevada City, at 2,600′ elevation, and comprises 2,100′ on the lode line, with irregular side lines. Idle. Müller & Walling, of Nevada City, owners.

*Murchie Mine* (Quartz and Hydraulic).—See Lone Star.

*Murphy & Grover* (*Hirschman*) *Mine* (Drift).—It is ¾ mile N.W. from Nevada City, at 2,642′ elevation, comprising the former Hirschman hydraulic mine. A bedrock tunnel is being driven N. into a spill from the main channel coming down the Harmony ridge; it is 1,000′ in length, with side drifts. Three men are doing assessment work. Murphy & Grover, of Nevada City, owners.

*National Gold Mining Co.'s Mine* (Quartz).—See our XIth and XIIth Reports, pp. 309 and 194. It is 1½ miles S.E. from Graniteville, at 4,575′ elevation, and comprises two claims. Since our last Report, the incline has been sunk 70′ deeper, or to 180′, and the south drift has been extended 400′, showing a 4′ vein. Between the 100′ and the 170′ levels some stoping has been done, and some cross-cutting is being done in the lower level. The capacity of the mill has been increased by the addition of 5 stamps, of 750 lbs. weight, to the former Huntington mill, making the capacity now 22 tons per day. A Rix compressor, for one Ingersoll drill, and a Worthington pump have also been added to the plant. During the winter 3 men, and in summer 15 men are employed. Mrs. McKillican, of North Bloomfield, owner.

*Nevada City Mine* (Quartz).—See Gold Hill.

*Nevada County Reduction Works.*—They are 1½ miles E. of Grass Valley, and used chiefly for chlorinating the concentrates from the Nevada County mines. The plant, which is very complete, is prepared to handle 4 tons per day. One thousand tons of concentrates were treated in 1894, and 800 tons in 1895. At present the works are idle. A. Maltman and S. C. Thompson, of Grass Valley, owners; A. Maltman, of Grass Valley, manager.

*Neversweat Mine* (Quartz).—It is 3 miles N.E. from Nevada City at 3,125′ elevation, and comprises two claims, 1,500′ by 600′ and 1,00 by 600′. The vein strikes E. and W., and dips 45° N., to a depth 200′, when it changes to a southerly dip. It lies mostly in the granit close to the contact, is from 3″ to 2′ wide, and carries heavily minera ized ore. A tunnel driven 1,600′ on the vein connects near the end wit an incline 300′ deep from the surface. A 50′ winze has been sunk belo the tunnel level. For about 200′ in length, the ground above the leve has been stoped to the surface. An incline, 500′ E. of the main work and 200′ higher, and pitching S.E., has been sunk 65′, and a drift ha been started. Four men are employed. J. Lyons, of Nevada City owner.

*New Idea Mine* (Quartz).—See Syndicate.

*New Pittsburg Mine* (Quartz).—See our XIth and XIIth Reports, pp 294 and 197. It is 1½ miles S. from Nevada City, at 2,780′ elevation and comprises 4,500′ by 600′. The vein, 1′ to 3½′ wide, strikes N. 12° E and dips 45° E., in diabase. The quartz is a ribbon rock, heavily min eralized, and said to carry 5% of sulphurets. The mine is at presen worked by tributers, most of the ore-supply coming from betwee the 400′ and 500′ levels. A winze is being sunk between the fift and sixth levels, and the level on the 500′ is being pushed ahead The 10-stamp mill runs intermittently. The power for both mill an hoist is water, requiring 60 miner's inches under 280′ and 295′ pressure but auxiliary steam is provided for hoisting and pumping. Fifteen me are employed. An incorporated company, of No. 61 Front Street, San Francisco, owner; — Neilson, secretary; T. J. Furbee, of Grass Valley superintendent.

*New Providence Mine* (Quartz).—It is on the Blue Tent road, 4 mile N. of Nevada City, at 2,800′ elevation, and comprises 3,000′ by 600′ The 2′ vein strikes N.E., and dips 80° N., in granite, and is said t contain 5% of high-grade sulphurets. The mine is opened through a 4′x 6′ incline 55′ deep, with short drifts on both sides, exposing in the breast 18″ and 24″ of quartz. A second shaft, started on a feeder, is 15 deep, showing 5″ of quartz. Two men are at work. E. D. Dean et al., of Nevada City, owners.

*New Rocky Bar Mine* (Quartz).—See Massachusetts Hill.

*New York Mine* (Quartz).—See Union.

*New York Hill Mine* (Quartz).—See Massachusetts Hill.

*Niagara Mine* (Quartz).—It is 1 mile E. from Nevada City, at 2,600′ elevation. The vein strikes E. and W., and dips 80° N., with a width of 2′ between granite walls; the quartz being heavily mineralized. There are two 4′x 6′ inclines, 80′ and 40′ deep respectively, with 4″ ejector for removing the water. Ten inches of water for power are procured from the Manzanita ditch, through 1,000′ of 7″ pipe, under 150′ pressure. Two men are employed. A. Durbin et al., of Nevada City, owners.

*Norambagua (Forest Springs Quartz Mining and Lumber Co.'s) Mine* (Quartz).—It is 3¾ miles S. of Grass Valley, at 2,100′ elevation, and comprises 4,000′ by 600′. The vein strikes N. and S., and dips 20° E. The old workings on the property, 600′ deep, are abandoned; the present workings are carried on through a drain tunnel, 1,700′ long, running E. into the hill until it reaches the vein, when it turns 300′ N. and 500′ S. toward the old shaft, showing the vein to average 8′ in width. From the drain tunnel to the outcrop are 500′ of backs. The

uartz carries arsenical and iron pyrites. Twenty-one tributers are at ork. W. Campbell, of Grass Valley, owner.

*Normandy Mine* (Quartz).—It is in Secs. 31 and 32, T. 16 N., R. 8 , and 4 miles S.W. of Grass Valley, at 2,250′ elevation. There are o parallel veins, 12″ and 18″ wide and 50′ apart on the surface, running N. and S., and dipping 35° W. and 65° W., in slate; the latter ing the foot-wall vein. On the hanging-wall vein is an incline 118′ ep. From the shaft, drifts have been run 100′ N. and 30′ S., at which int a cross-cut is being run for the foot-wall vein; it is 20′ long at esent. Idle. J. Richards and F. Dulman, of Grass Valley, owners.

*North Banner Consolidated Tunnel Co.'s Mine* (Quartz).—See our IIIth and XIIth Reports, pp. 420 and 194. It is 3½ miles S.E. of evada City, at 3,200′ elevation, and comprises five claims. Since our st Report the mine has changed owners, and is now being pumped out; 0′ of water being in the mine in August, 1896. Seven men are ployed. An incorporated company, of San Francisco, owner; G. ainhart, of Grass Valley, superintendent.

*North Bloomfield Mine* (Hydraulic).—See our VIIIth, IXth, and IIth Reports, pp. 454, 122, and 195. It is situated at the town of orth Bloomfield, at 3,000′ elevation, and employs thirty-five men draulicking behind restraining dams. North Bloomfield Gravel Co., San Francisco, owner; L. L. Myers, of North Bloomfield, superintendent.

*North San Juan Quartz Mining Co.'s* (*Boss*) *Mine* (Quartz).—It is 1½ iles W. of Sebastopol, and comprises two claims. The south vein rikes N., and dips 75° E., carrying 5′ of quartz, between slate walls. 6′x 8′ vertical shaft has been sunk 200′, and drifts run at the 50′, 70′, d 100′ levels, both N. and S.; on the south side, the ground from the ′ level to the surface has been stoped. One half mile from the shaft a 5′ Huntington mill, which crushes 25 tons per day. The power for ist and mill is steam. Idle. An incorporated company, of San Fransco, owner; H. W. Morris, of No. 141 First Street, San Francisco, cretary.

*North Star Mine* (Quartz).—See our VIth (Part II), VIIIth, Xth, Ith, and XIIth Reports, pp. 44, 428, 376, 270, and 195. It is 2 miles from Grass Valley, at 2,470′ elevation, and comprises 800′ by 3,300′. ne main working shaft has a depth of 2,400′ on the dip, with 23 levels, tending 900′ W. and 1,400′ E. The present supply of rock for e mill is taken from different points between the 500′ and the 2,300′ vels. One hundred and thirty men are employed underground and relve on the surface. P. C. Roberts, of Grass Valley, superintendent.

*North Star Mine* (Quartz).—It is on Cañon Creek, 5 miles N.E. from ashington, at 4,600′ elevation, and comprises two patented claims, ne on each side of the creek. The vein strikes N. and S., dips 75° E., d shows a 6′ ledge, with slate casing in granite formation. There is a 0′ tunnel on the vein. Idle. H. Kohler, of Washington, owner.

*Norway Mine* (Quartz).—It is in God's Country Ravine, 7 miles N.E. om Washington, at 4,500′ elevation. The 1′ wide vein strikes N. and , dips 65° E., in protogene. There are four tunnels on the veins, the ngest being 160′, and most of the ground to the surface stoped. Two en are at work. Marcot & Nelson, of Washington, owners.

*Odin Mine* (Drift).—See our XIth and XIIth Reports, pp. 301 and 06. It is 1¼ miles N. of Nevada City. Idle. An incorporated comany, of Nevada City, owner.

*Ogdensburg Mine* (Drift).—See Fisk.

*Old Home Mine* (Quartz).—It is 5½ miles N.W. of Nevada City, a 2,940′ elevation, and comprises one claim, formerly a part of the Mour Vernon Mine. The 16″ vein strikes N.E., and dips 30° N.W., betwee greenstone and grano-diorite walls. The quartz is heavily mineralize below water-level, and the sulphurets are said to be high-grade. 4′x 5′ incline has been sunk 50′ and about 200′ of drifts run from i and the ground stoped to the surface. Three ore-shoots have been cu Two men are at work. Kirkham Bros., of Nevada City, owners.

*Omaha and Lone Jack Consolidated Mine* (Quartz).—See our VIIIth Xth, XIth, and XIIth Reports, pp. 433, 373, 273, and 197. It is 1 miles S. of Grass Valley, at 2,500′ elevation, and comprises 2,400′ o the lode line. The vein strikes N. and S., and dips 32° W., with a average width of 12″, in a slate formation near the contact with syenit Since our last Report 200′ have been sunk, making seventeen stations i all; also 2,000′ of drifts run, mostly south. Most of the ore at preser comes from the seventh level. Fifteen out of twenty-five of the 800-l stamps in the water-power mill are running. There are four improve belt Frue vanners. Twenty-eight men are employed. An incorporate company, of Grass Valley, owner; G. Mainhart, of Grass Valley, super intendent.

*Omega Mine* (Hydraulic).—It is 3 miles E. of Washington. Th company has leased ten claims to Chinese, but work was stopped o account of the restraining dam washing out. An incorporated compan of San Francisco, owner.

*Ophir Mine* (Quartz).—See Empire.

*Oregon* (*Kate Hayes Hill*) *Mine* (Quartz).—It is in South Gras Valley, at 2,550′ elevation. The vein courses N. and S., and dips 4 W., between diorite and diabase, and is 1′ and 2′ wide, carrying 1½% c sulphurets. A double-compartment incline is 285′ deep, with three level extending about 150′ both N. and S., except the bottom level, which i 60′ N. and 140′ S. A drain tunnel, 800′ long, cuts the shaft at 120′; i is run in on the vein, and the ground along the pay-shoot, 200′ long, i stoped to the surface. No hoisting works. At present idle, but wi resume shortly, when hoisting works will be erected. G. Mainhart, J Burke, J. Fillmore et al., of Grass Valley, owners.

*Original Empire* (*Ophir*) *Mine* (Quartz).—See our VIIIth, XIth, an XIIth Reports, pp. 426, 273, and 189. It is 1½ miles S.E. from Gras Valley, at 2,650′ elevation, and comprises six claims. The principa workings at present are north of the shaft, between the 2,000′ and 2,10 levels. A large number of tributers are employed. The 40-stam water-power mill receives water from the Grass Valley Water-Power Co under 440′ head at the mill and 430′ at the hoist. There are in all fiv Pelton wheels, besides an auxiliary steam-engine for pumps in case o accidents. The compressor has a capacity of six drills, but only two ar running. The mine produces 42 tons of sulphurets per month, which ar sold. From 125 to 130 men are employed; 60 on day's pay, the remain der on contract and tribute work. An incorporated company, of Gras Valley, owner; P. Walker, of Grass Valley, superintendent.

*Orleans Mine* (Quartz).—It is between Osborne and Ophir Hills, 1 miles S.E. from Grass Valley, at 2,700′ elevation, and comprises 8 acres of patented ground. The 6″ vein strikes N. and S., and dips 34 to 43° W., in diorite. The 6′x 9′ double-compartment incline shaft i

35′ deep, and is being driven ahead. Some tributers are taking ore rom stopes between the third and fourth levels. The water-power hoist ses a 6′ Pelton wheel, under 441′ pressure. The nozzles are provided ith the Chavanne patent regulator. The pumping plant consists of wo 8″ Cornish plungers, making five 4′ strokes per minute, and are riven by steam-power. The 5-stamp mill, with 850-lb. stamps, is run t 95 drops per minute, with 6″ drop and 4½″ discharge, using No. 40 rass wire screens, and crushing 1⅝ tons per stamp. The screens are ut on somewhat differently from the usual method. Each section of creen is drawn tight over a wooden frame made to fit snugly into the ivisions of the screen-frame, and when so placed is retained in its osition by an iron strap fastened in front. This is done to permit of eadily reversing each section in case the lower part is ruptured, with-ut having to put in an entire new screen. The apron-plates are set on grade of 1½″ to the foot and dressed with lime, applied with chamois kin. A Hendy-Norbaum concentrator handles the 3% of concentrates, aving, it is claimed, an especially fine grade of slimed sulphurets that oat on the water. The mill is run by a 6′ Pelton wheel, under 441′ ressure, with water obtained from the Empire reservoir through 1,400′ f 8″ to 6″ pipe. Nine men are employed. An incorporated company, f No. 101 Sansome Street, San Francisco, owner; W. Olney, Jr., secre-ary; C. A. Brockington, of Grass Valley, superintendent.

*Orleans Mine* (Quartz).—It is opposite the Red Hill Mine, 2 miles W. rom Nevada City, at 2,400′ elevation. The narrow vein strikes N.W., ith the dip, near the granite contact, varying from nearly vertical to 0° E. A drift 600′ long is being driven ahead by two men. C. Brock-ngton et al., of Grass Valley, owners; J. Richards, of Grass Valley, uperintendent.

*Oro Fino Mine* (Quartz).—It is situated below the dam at Meadow ake, at 7,300′ elevation, and is an extension of the old California vein, hich strikes E. and W. and dips S. The very heavy outcrop is 40′ wide n places. On the property is a 4-stamp mill and a Frue concentrator, un by water obtained from the lake. Assessment work only. F. Cook nd J. P. Clark, of Cisco, owners.

*Oro Fino Mine* (Quartz).—See Goodall Consolidated.

*Oro Fino Mine* (Quartz).—See Stanford.

*Oro Grande* (*Mount Vernon*) *Mine* (Quartz).—It is 5½ miles N.W. of Nevada City, at 2,875′ elevation. The vein strikes N., and dips 80° E., etween slate walls. Along the surface five parallel outcrops can be raced inside of 50′, undoubtedly uniting as they go down. The present orking is chiefly confined to opening up the old Mount Vernon works, hrough an 800′ tunnel on the north end, which intersects the old incline ithin a short distance of the bottom; it fails to drain the entire old orks. A new patent mill, with a Dodge rock-breaker, is in course of rection. (Since our visit in December, 1895, the mill was tried and ejected.) Nine men are employed. An incorporated company, of No. 96 First Street, San Francisco, owner; C. W. Weld, secretary; S. T. Murchie, of Nevada City, superintendent.

*Osborne Hill Mine* (Quartz).—See our XIIth Report, p. 198. It is 3 miles S.E. from Grass Valley, at 2,800′ elevation, and comprises two laims. Idle. An incorporated company, of San Francisco, owner.

*Osceola Mine* (Quartz).—It is 1 mile S. of Rough and Ready, at 2,750′ levation. Idle. Bert Moody et al., of Gold Run, Placer County, wner.

*Pacific Mine* (Quartz).—See Diamond.

*Peabody Mine* (Quartz).—See our XIIth Report, p. 198. It is in the town of Grass Valley. J. H. von Schroder et al., of Grass Valley, owners.

*Pennsylvania Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 383, 276, and 198. It is in T. 16 N., R. 8 E., 1½ miles from Grass Valley. Idle. Pennsylvania Consolidated Gold Mining Co., of Grass Valley, owner.

*Perseverance Mine* (Drift).—It is 10 miles N.W. of Emigrant Gap, at 5,500′ elevation, and comprises 3,000′ along the course of an ancient channel on Fall Creek. A bedrock tunnel has just been started, which is expected to reach the channel in 300′. The gravel carries coarse gold and rests on granite bedrock. One man is at work. N. S. Douglas and J. Mattingly, of Emigrant Gap, owners.

*Pioneer Reduction Works.*—They are situated ¾ mile S. of Nevada City. The works comprise a chlorination plant, a matte furnace, and a Tustin pulverizer, of 6-ton capacity, driven by 40 H.P. engine. For the matte, a reverberatory furnace, 9½′x 14′ inside measurement, is used, with a sand hearth 3½′ thick, burning petroleum with superheated steam. The petroleum is introduced through a flat burner, together with the steam. A charge in the furnace consists of 2 tons of green ore mixed with the tailings from the chlorination process that still contain some gold. From 12 to 15 tons are treated per day, requiring 600 gallons of petroleum per twenty-four hours, which equals in effect 11 cords of wood. (130 gallons is equivalent to 1 ton of coal.) Ten tons of the charged material yields 1 ton of the matte, carrying from 15% to 20% of copper. A ton of matte is produced per day. The stack for the matte furnace is 60′ high, 3½′ inside measure. The chlorination plant has a 4-ton furnace. Twelve men are employed. An incorporated company, of Nevada City, owner; J. H. English, secretary; B. Hall, of Nevada City, superintendent.

*Polkinghorn Mine* (Quartz).—See Massachusetts Hill.

*Potosi Mine* (Quartz).—See Gold Flat.

*Providence Mine* (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 47, 418, 290, and 198. It is 1 mile W. of Nevada City, at 2,275′ elevation, and comprises 180 acres, or nearly 5,000′ on the lode line. Since our last Report the main incline has been extended from the 1,550′ to the 1,780′ level, and the veins, both back and front, developed for a distance of 700′ S.; also, 550′ of a cross-cut and several lateral drifts, amounting to 175′ in length, have been driven, and an upraise of 205′ made. During the past sixteen months over 3,000′ of drifting has been done. Pay-shoots have been opened on the lower as well as on the 1,500′ and 1,250′ levels. On the back, or so-called "slate vein," the walls are in rolls, and the pay-ore is lenticular and overlapping, pitching south. The ore on the shoots is stated to carry 5% of sulphurets, and on the back vein some handsome specimens of telluride are found. Water-power is used throughout the entire works, and obtained from the South Yuba Ditch Co., requiring 140 miner's inches, which is piped across Deer Creek. One hundred and four men are employed, of whom 78 are miners. Providence Gold Mining Co., of San Francisco, owner; W. McKinley, of Nevada City, superintendent.

*Ragon Mine* (Quartz and Drift).—It is 3 miles W. of Nevada City, at 2,700′ elevation, and comprises 80 acres. The gravel channel has a

PROVIDENCE MINE, MILL, AND FURNACE.

westerly course, the main pay-channel being about 100′ wide, with a pipe-clay capping 70′ deep. The gravel carries large granite and quartz bowlders and scaly gold. The ground is worked through a 5′x 6′ double-compartment incline, 240′ long, giving 70′ perpendicular depth, and furnished with a hoist and Cornish bucket pump, run by 25 inches of water, applied to 5′ and 8′ Pelton wheels, under 58′ pressure, from the South Yuba Ditch Co. The main bedrock gangway is 170′ long and connects with the channel through a 15′ upraise. The breasts are carried 5′ high, and two shifts of four breasters each take out 50 car-loads, of 1,400 lbs. each, per shift, and said to be worth $1 per car. The mine is ventilated through connection with old drifts. The surface of the ground is said to have paid well in early days for washing. The gravel-dump holds 100 cars, and empties through 12 boxes, 14″x 16″, supplied with slat riffles; the first ones are cleaned up every day. The waste-water from the wheels and the mine is use dfor washing. The tailings are retained and worked a second time. A quartz lead, from 2′ to 4′ wide, with a N.W. strike, has been followed down through the gravel, and is said to yield good results. Eighteen men are employed. G. Ragon, of Nevada City, owner; — Jacobs, of Nevada City, superintendent.

*Rainbow Gold Mine* (Quartz).—See our XIIth Report, p. 199. It is 5 miles S.E. from Eureka, at 5,500′ elevation. The 20″ vein strikes N.W., and dips 50° E., in granite. Idle. McBean & Meade, of Washington, owners.

*Redan Mine* (Quartz).—See Electrical Mining Co.

*Red Dog Mining Co.'s Mine* (Drift).—It is 1 mile N. from You Bet, at 2,910′ elevation, and comprises 200 acres on the Blue Lead channel. At present a 200′ incline shaft is being sunk to reach bedrock, and is 50′ deep now. The hoist is run by water-power from a 5′ Knight wheel, taking water, through Old Chalk Bluff ditch, from the head of Deer Creek. Ten men are at work. An incorporated company, of You Bet, owner; F. Goding, of You Bet, superintendent.

*Red Hill Mine* (Quartz).—It is 2 miles W. of Nevada City, at 2,550′ elevation, and comprises 48 acres on the north bank of Deer Creek. The surface has been formerly hydraulicked and has yielded many rich pockets in ochery seams of quartz traversing the bedrock. The general trend of the seams is N.W., with a dip of about 24° E. Where the present works are, the formation is clay, about 1,000′ wide, showing a former slate structure, situated to the west of the granite, between it and the slate, and traversed by a wide, hard dike of metamorphic silicious schist (Lindgren). A shaft has been sunk 60′ and drifts run, following a narrow, rich seam of ochre and quartz. An open cut has been carried up, following the same seam at about 60′ distant. This cut is over 400′ in length and 40′ deep, and will ultimately reach a length of 700′ and a depth of 70′. Much of the red clay itself will pay to mill. A Griffin mill, to be driven by electric power, is in course of erection. Eight men are employed. Red Hill Gravel Mining Co. (Ltd.), of Scotland, owner; G. Treadwell, of Nevada City, superintendent.

*Red Hill Specimen Mine* (Quartz).—It is 1¼ miles W. of Nevada City (adjoining the above), at 2,650′ elevation, and comprises 2,650′. The vein strikes E. of N., dips S., and is from 4″ to 6″ wide in a clay formation between the granite and slate. A series of shallow (10′) shafts have been sunk for prospecting purposes, and a 40′ shaft sunk to

cut the main vein about 15′ yet below. Two men are at work. A. Muller, of Nevada City, owner.

*Red Point Mine* (Quartz).—It is ½ mile N.W. from Washington, across the Yuba River, at 2,650′ elevation. The formation is an altered rock in the vicinity of the slate and serpentine contact, in which there is a gold-bearing fissure striking W. of N., nearly vertical, with no quartz. Surface work and an 80′ tunnel comprise the development. Two men are at work. W. E. Yeaw and E. A. Langford, of Washington, owners.

*Reward Mine* (Quartz).—See our XIIth Report, p. 199. It is 1 mile S.W. from Nevada City, at 2,600′ elevation, and comprises two full claims east of the Providence Mine. The 16″ vein strikes N. and S., and dips 36° E., in grano-diorite. On the pay-shoot, which pitches apparently north, the quartz is said to contain 5% of sulphurets of high grade. The better portion of the sulphuret ore is hand-sorted, sacked, and shipped. The 5′x 8′ double-compartment main shaft is 400′ deep, and supplied with hoist and pumps driven by steam furnished from a 60 H.P. boiler. The pumps consist of an 8″ plunger and a 6′ lift. A second temporary 5′x 6′ shaft has been sunk to a depth of 300′, with a 15 H.P. steam hoist, to tap the drain tunnel of the California Mine adjoining, from which point a drift has been run 600′ N., where an upraise is being made to connect with the bottom of the main shaft. This drift, which, in connection with the California's adit, will serve as a drain tunnel, shows a continuous vein with a pay-shoot of high-grade ore 250′ long. No work is being or will be done from the main shaft at present, until connection is made through the upraise, when drainage and ventilation for this part of the mine will be secured. No ore is crushed at present. An incorporated company, care of Union League Club, San Francisco, owner; S. W. Backus, secretary; J. T. Gribble, of Nevada City, superintendent.

*Rising Sun Mine* (Quartz).—It is 5 miles N.E. from Washington, at 4,400′ elevation. The vein strikes W., and dips E., in granite. A shaft is down 25′, showing a 3′ vein, and at the shaft-mouth a tunnel has been run 60′ on the vein. Idle. R. Maloney, of Washington, owner.

*Rocky Bar Mine* (Drift).—See our XIIth Report, p. 199. It is ½ mile E. from Washington, at 2,650′ elevation, and comprises 3,000′ on the channel of the South Yuba River. Since our last Report 250 sq. ft. of the channel have been worked, and a 1,000′ drift run up and across the channel. The derrick, with 75′ mast and 65′ boom, is worked by a 16′ overshot wheel, using 300 miner's inches of water, from Poorman's and Cañon creeks, brought through 4 miles of ditch. Six men are employed. J. O. & E. A. Hayes, of Washington, owners.

*Rocky Bar Mine* (Quartz).—See Massachusetts.

*Rocky Bar Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 433 and 200. It is on Osborne Hill, 2 miles S.E. of Grass Valley. Idle. H. Sylvester, of Grass Valley, owner.

*Rose Hill Mine* (Quartz).—It is in South Grass Valley, at 2,600′ elevation, and comprises 12 acres of ground on two parallel N. and S. ledges, one pitching E. and the other W., in a grano-diorite formation; they vary in width from a few inches to a couple of feet. A 860′ tunnel taps the ledge and is intersected by a vertical shaft 120′ deep, from which several hundred feet of drifts have been run. There is a 3-stamp double-discharge mill, with 950-lb. stamps, run by a gasoline-engine, to be changed to electrical power later. It is furnished with a swinging

apron, and crushes 5 tons in twenty-four hours. Idle. An incorporated company, of No. 320 Sansome Street, San Francisco, owner; R. D. Lawrey, of Grass Valley, superintendent.

*Russell Ravine Mine* (Quartz).—See Glenn.

*Sanders Mine* (Quartz).—See Electrical Mining Co.

*San José Mine* (Drift).—See our XIIth Report, p. 201. It is on Deer Creek, 6 miles E. of Washington. Idle. An incorporated company, of San José, owner.

*Sauvee Mine* (Quartz).—It is 1 mile S. of Grass Valley, at 2,475′ elevation, and comprises 91 acres of patented land. Five veins have been found crossing the property, varying from 1′ to 5′ in thickness, supposed to be extensions of the W. Y. O. D., Pennsylvania, Bullion, and Diamond mines. The general strike is N. and S., and they all pitch W., and are from 150′ to 300′ apart, in a grano-diorite formation near the slate contact. At the north end of the claim, between two veins, is a 185′ vertical shaft, furnished with a steam hoist. On the south side of the claim, ¼ mile distant, is a tunnel, cross-cutting 400′ and then turned 400′ on the vein, showing 2′ of quartz well mineralized. One hundred feet from the breast is a cross-cut 700′ long to a solid body of sulphurets 30′ wide. This tunnel gives 60′ of backs, all stoped to the surface. Idle. Mrs. F. Sauvee, of Grass Valley, owner.

*Sebastopol Mine* (Quartz).—It is on Osborne Hill, 2¾ miles S.E. of Grass Valley, at 2,700′ elevation, and comprises 2,200′ by 300′ at one end line and 500′ at the other, patented ground. The 4″ to 10″ vein strikes W. of N., and dips 45° W., between diorite walls. The quartz is said to carry 1½% sulphurets of a good grade. The new double-compartment incline is 105′ deep; the old incline was 250′ deep; several shaft prospects have been sunk to water-level. There is also an 800′ drain tunnel. Idle. J. Bennallack et al., of Grass Valley, owners.

*Sirius Mine* (Quartz).—It is 7 miles E. from Washington, at 4,300′ elevation. The vein, from 3′ to 4′ wide, strikes N. and S., and dips E., in porphyritic granite. It has been worked through a 4′x 6′ incline, 65′ deep, sunk on the vein; also by a 190′ tunnel on the vein. Idle. C. O. Anderson et al., of Nevada City, owners.

*Slate Ledge Mine* (Quartz).—It is 5 miles S. of Grass Valley, at 1,840′ elevation, and comprises 40 acres. The vein has an E. and W. course and dips 30° S., averaging from 16″ to 18″ in width, between slate and diorite walls. The quartz is said to carry 2% sulphurets. The vein is worked through a tunnel, 793′ long, to a station, where an incline has been sunk 347′ below; the tunnel is continued for 1,000′ on the other side of the incline. Four drifts extend E. from the incline, below the tunnel level, to distances of 954′, 636′, and 540′, showing three ore-shoots pitching west. Most of the vein above the main tunnel is stoped out. An upraise from the shaft to the surface permits of the use of water-power for hoisting and pumping, with a 4′ hurdy wheel, which takes the water under 100′ head. The 4″ bucket- and lift-pump has a 4′ stroke and makes 10 strokes per minute. The water is taken from irrigation ditches belonging on the property, fed from Wolf Creek. One half mile from the mouth of the tunnel is a 10-stamp mill, with 750-lb. stamps, which crushes 1¾ tons per stamp, and is furnished with two Johnston concentrators; the whole is run by a 6′ hurdy wheel under 30′ head. Seven men are employed in the mine and two in the mill, when running.

An incorporated company, of Grass Valley, owner; A. F. Perrin, of Grass Valley, secretary and superintendent.

*Sleeping Beauty Mine* (Quartz).—It is 3 miles N.E. from Moore's Flat, at 3,100′ elevation, and comprises two claims on the Middle Fork of the Yuba River. The 1′ to 6′ vein strikes N.W., and dips 40° S.W., in a greenstone formation. The vein carries a large percentage of arsenical pyrites, and above water-level the quartz carries coarse, heavy gold. There are two tunnels, one at each end of the claim; the longer one is 130′, and has a 30′ incline below it, and an upraise and stopes to the surface. The second tunnel is on a lower level, farther up the river. The richest ore is worked in a hand-mortar. Two men are prospecting the ground. Rander & Vizzard, of Moore's Flat, owners.

*South End Mine* (Quartz).—See Goodall Consolidated.

*South Idaho Mine* (Quartz).—It is 1 mile E. of Grass Valley, at 2,500′ elevation, and comprises 2,300′ by 600′. The vein trends S.E., running parallel with the Idaho, and dips S., between slate walls. There is a vertical shaft, 100′ deep, with a 20′ cross-cut to the other side of the vein and a short drift of 15′ along the foot-wall. The ore is said to carry 4% of sulphurets. A 12′ cross-cut at the 60′ level did not reach the wall. The hoist is a horse-whim. Two men are at work. D. C. Webster, of Grass Valley, owner.

*Spanish Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 442 and 200. It is 3 miles W. from Washington, at 2,700′ elevation. Since our last Report the mill has been moved 300′ down the hill to the mouth of the lowest tunnel, and 4 new Huntington mills and 10 stamps added, bringing the mill capacity up to 100 tons per day. All the mining is carried on through the deepest tunnel. Water-power is used under 600′ pressure. Twenty men are employed. F. W. Bradley, of Wardner, Idaho, owner; D. Johnson, of Washington, superintendent.

*Spanish Mine* (Quartz).—See our XIth and XIIth Reports, pp. 292 and 200. It is on Woods Ravine, 1¼ miles N.W. of Nevada City, at 2,500′ elevation. The vein strikes N. and S., in granite, and is over 3′ in width, carrying low-grade quartz, heavily sulphuretted. Since our last Report a 10-stamp mill has been erected and a hoisting and pumping plant put on, sufficient to go 1,000′ in depth. The mine is opened with a 400′ incline. Two men are pumping water. R. R. Colgate, of New York, owner; A. L. Begbie, of Nevada City, superintendent.

*St. Louis and Wide West Mine* (Quartz).—See Alpine.

*Stacey Mine* (Quartz).—See Glenn.

*Stanford (Oro Fino) Mine* (Quartz).—It is 4 miles W. of Nevada City, at 2,450′ elevation, and comprises 2,200′ by 600′. The vein strikes N.W., and dips N.E., changing from 50° near the surface to 25° below the 200′ level. The fissure is partly filled with gangue, carrying short ore-shoots of about 100′ in length. The double-compartment 5′x 7′ main incline is 315′ deep, tapped 40′ from surface by a 650′ drain, and with levels below the adit, extending both N. and S., about 100′ along the fissure. Ore for the mill is supplied from stopes between the second and third levels S. of the shaft. The 10-stamp mill has 950-lb. stamps, dropping 90 times per minute on 6″ drop, crushing 10 tons on day shift only. The hoist and pump, as well as the mill, are run by water-power from South Yuba ditch; the former two with a 9′ Pelton wheel under 170′ head, while the mill has a 4½′ Pelton wheel, and the four Frue vanners a 2′ wheel.

Twelve men are employed. — Curry and Judge Caldwell, of Nevada City, owners.

*St. Gotthardt Mine* (Quartz).—See our XIIth Report, p. 201. It is 4 miles N. of Columbia Hill. Idle. An incorporated company, owner.

*St. Johns Mine* (Quartz).—See our XIth and XIIth Reports, pp. 281 and 201. It is on Alta Hill, ½ mile N. of Grass Valley, at 2,450′ elevation, and comprises 3,720′ patented ground, on two E. and W. parallel veins along the contact of slate and serpentine, dipping 50° N. Idle. An incorporated company, owner; William Berry, of Grass Valley, manager.

*St. Louis Mine* (Quartz).—See Alpine.

*Stockbridge Mine* (Quartz).—See Massachusetts Hill.

*Summit Consolidated Gold Mining Co.'s* (*Fortuna*) *Mine.*—It is 1 mile S. of Nevada City, at 2,700′ elevation, and comprises four claims, known as *Dodo*, *Fortuna*, *Orleans*, and *Thomas*. The vein courses N.W. and S.E., and dips S.W., in slate and diabase, carrying a heavy percentage of sulphurets, with ribbon quartz. It is being worked under a bond; the old Fortuna shaft, 240′ deep, is being cleaned out and sunk deeper. There is a steam hoist and pump on the shaft, and 8 men are employed. Englebright, Waggoner, et al., of Nevada City, owners; G. A. Nihell, of Nevada City, superintendent.

*Sunny South Mine* (Quartz).—See Gray Eagle.

*Sweet's Flat* (*Tung Kow*) *Mine* (Placer).—It is 1½ miles S. of Washington, and comprises 10 acres of gravel. The gravel bank is 15′ high, carrying many heavy bowlders, and requiring a water-power derrick with a 55′ boom. The gravel requires blasting, and is washed through 10 boxes set on a 4″ grade, lined with wooden blocks; water is taken from Jephson Creek, the season lasting five months. Eight Chinese, owners, are at work.

*Syndicate Mine* (Quartz).—It is in Sec. 2, T. 15 N., R. 8 E., 2½ miles S. of Grass Valley, adjoining the Allison Ranch Mine, at about 2,600′ elevation, and embraces the *Golden Chain*, *Great Eastern*, and *New Idea* claims, containing 53 acres in all. The vein strikes N.W., with a 40° E. dip that passes through the first two claims, while the latter has a parallel vein with a westerly dip, which shows in the bed of Wolf Creek. Idle. Wm. Berry et al., of Grass Valley, owners.

*Treadwell* (*Grass Valley*) *Tunnel Co.*—An incorporated company has been formed, and preliminary surveys are being made for the purpose of running a deep tunnel to drain the mines in the vicinity of Nevada City and Grass Valley. The initial point for the mouth of the tunnel is ¾ mile above Jones' Bar, on the south bank of the Yuba River. A depth of 1,400′ is expected to be attained at the Providence Mine. G. Treadwell, of Nevada City, manager.

*Tung Kow Mine* (Placer).—See Sweet's Flat.

*Twin Sisters Mine* (Quartz).—It is 2 miles S. of Eureka, at 3,100′ elevation, and comprises two claims with parallel veins about 8″ wide, striking N. and S., and dipping 45° W., between granite walls. It is a prospect, with a 20′ incline and an open cut. Two men are at work. J. Holligan et al., of Graniteville, owners.

*Union Mine* (Drift).—See our XIIth Report, p. 201. It is on Relief Hill, 3½ miles from Bloomfield, at 2,500′ elevation, and comprises 90 acres of ground. The bedrock tunnel is 2,000′ long to the channel, which is 220′ across, running E. and W., and is worked in breasts 6′ to

7′ high and 70′ wide, yielding 60 cars of 2,500 lbs. each per day. Two thirds of the gravel is cobbles and bowlders; the gold it contains is medium-coarse. The ore-dump holds 325 cars, and is washed twice a week through four strings of sluices with intermediate drops. A restraining dam in Union Cañon permits the tailings to be reworked. During the winter months wash-water is free; the rest of the season it is supplied from the Bloomfield ditch. Twenty-seven men are employed. — Jephson et al., of Relief, owners.

*Union* (*New York*) *Mine* (Quartz).—It is 3 miles E. of Nevada City, at 2,700′ elevation. The vein strikes N. and S., and dips 40° E., along the contact with a granite foot-wall. The vein averages 12″ in width and is said to carry 5% of high-grade sulphurets, mostly iron, but with some lead. The workings are carried on through a tunnel 1,100′ long on the vein, which gives 165′ of backs, which have been stoped for a length of 700′ to the surface. The old workings lie south of the present works. Assessment work only is being done. L. Nihell et al., of Nevada City, owners; G. Nihell, of Nevada City, superintendent.

*Viola Mine* (Quartz).—It is 4 miles N.E. of Cisco, at 7,000′ elevation. The vein, 8′ wide, strikes N.E., and dips 60° S.E., between syenite walls. There are two shafts, 20′ and 50′ deep, and three open cuts on the vein. Assessment work only. Mrs. Viola Davis and H. Smith, of Cisco, owners.

*Washington Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 440 and 391. It is on the Yuba River, 6 miles E. of Washington, at 3,675′ elevation. Idle. A. Tregidgo, of Grass Valley, owner.

*Waukeshaw Mine* (Drift).—It is on Relief Hill, 3½ miles E. of North Bloomfield, at 3,675′ elevation, and comprises 150 acres. It was formerly a hydraulic mine. It has a bedrock tunnel, 2,600′ in length, through which the gravel is hauled in 3-car trains by mules. The gravel is also washed through a 1,900′ tunnel, dumping into the South Yuba River. This tunnel is 6½′x 4½′ by 7′ high. The gravel is breasted 6′ high, 35′ wide, and a breaster breaks down three 1-ton cars per shift. Two hundred miner's inches of wash-water, under 200′ head, is obtained from Logan Cañon, through a ditch 1,000′ long. The flume is 2′ wide, and set on a 10″ grade. Ten men are employed. J. R. Jones et al., of Relief Hill, owners.

*West Delhi Mine* (Quartz).—It is 3½ miles N.W. of North Columbia, at 2,550′ elevation, and comprises three claims. The 6′ vein trends N. 20° W., and dips 55° E., in a slate formation. It is opened by tunnels, which will ultimately give 2,000′ of backs. The present tunnel, a cross-cut 300′ long, will require to be extended another 100′ to reach the vein, with 150′ of backs. There is an 8-stamp water-power mill with 900-lb. stamps, crushing 15 tons per day, and 4 Hendy old-style concentrators. Six men are at work in the tunnel. R. McMurray et al., of San Francisco, owners; C. H. Mallen, of Nevada City, superintendent.

*West Harmony Mine* (Drift).—See Delaware.

*White Wings Mine* (Quartz).—It is 6 miles N.W. from Nevada City. The 16″ vein strikes N.W., and dips 60° S.W., between slate walls. The quartz is heavily mineralized, the sulphurets being of medium grade. The developments consist of a cross-cut tunnel 150′ to the vein, which continues 100′ along the same. The old workings have been abandoned. Four men are at work. C. Moody et al., of Nevada City, owners.

*Wild West Mine* (Quartz).—See Alpine.

*William Penn Mine* (Quartz).—See Crown Point.

*Willow Valley Mine* (Quartz).—It is in Sec. 4, T. 16 N., R. 9 E., in Willow Valley, 3 miles E. from Nevada City, at 2,900′ elevation. The vein strikes N.E., and dips 30° N.W., in granite; the extreme northeast end reaching into the slate. The developments consist of an incline shaft 250′ deep, not accessible at present, and a 260′ cross-cut to the vein. Idle. G. W. Welch, of San Francisco, owner.

*Winfield Scott Mine* (Quartz).—See our XIth and XIIth Reports, pp. 283 and 203. It is 3 miles S.E. from Grass Valley, and has been worked by the Hartery Mining Co., of Grass Valley, owner.

*Wisconsin and Illinois Mine* (Quartz).—See our Xth and XIth Reports, pp. 375 and 284. It is 4 miles S. of Grass Valley, at 2,300′ elevation. The vein is about 13″ wide, strikes E. and W., and dips 40° S. Worked mostly by tributers. It is opened by a 5′x 14′ incline to a depth of 500′, and is furnished with steam hoist and pumps. About 27 men are employed. J. N. Lakenan, of Grass Valley, owner.

*W. Y. O. D. Mine* (Quartz).—See our VIIIth, Xth, and XIth Reports, pp. 435, 379, and 268. It is 1 mile S. of Grass Valley, at 2,610′ elevation, and comprises 1,900 by 600′. The main vein strikes N. 6° W., and dips 38° W.; there is a parallel back vein about 400′ distant that has not been developed yet; the walls are slate and syenite on the hanging and slate and grano-diorite on the foot, with an occasional chlorite casing. The quartz, which has an average width of 15″, is well mineralized, and said to carry 3% of high-grade sulphurets. Several pay-shoots have been developed. During 1895 the following work was done: 500′ of sinking, 1,700′ of upraises, and 3,800′ of drifts. The mill has 20 stamps weighing 850 lbs. each, and crushing 2½ tons per stamp through No. 40 tin-punched screen. There are 16′ of apron-plate set on grade 1¾″ per foot, 8 Frue vanners, two 4′ clean-up pans, and 1 barrel, all run by steam-power. The air-compressor drives 6 Rand drills; the hoisting engine is 75 H.P., and there are 8 pumps. The entire plant is very complete. Eighty-five men are at work. An incorporated company, of Grass Valley, owner; T. H. Simonds, of Grass Valley, superintendent.

*Wyoming Consolidated Mine* (Quartz).—It is in South Grass Valley, at 2,625′ elevation, and comprises 2,900′ along the lode, but of varying width of side lines. The different claims are designated the *Crandall*, *Narragansett*, and *Wyoming*. The first and third are on a N. and S. vein 1′ to 3′ wide, and dip 30° W., in syenite formation. The Narragansett is 700′x 300′ and on a N.E. vein 1′ to 3′ wide, and dips 30° N.W., intersecting the other vein in syenite. The quartz is well mineralized with lead and iron sulphurets. A 5′x 8′ incline is 208′ deep on the N. and S. vein, with 200′ drifts both N. and S. A tunnel 275′ long has not reached the vein yet. On the Narragansett a 400′ drift reaches the vein in 300′ and then turns 100′ on vein, giving 70′ of backs. This vein has less sulphurets, but is said to be high grade. Idle. An incorporated company, of Grass Valley, owner; B. F. Runnels, of Grass Valley, manager.

*Wyoming Mine* (Quartz).—See our VIth (Part II), XIth, and XIIth Reports, pp. 48, 291, and 203. The property is now owned by the Champion Mining Co., and worked in connection with the Champion and Merrifield mines. F. Zeitler, of Nevada City, superintendent.

*Yellow Diamond Mine* (Quartz).—It is 4 miles W. of Nevada City, at 2,400′ elevation, and comprises two full claims. The vein strikes N.W., and dips 45° N.E. in the granite close to the contact, and is from 2′ to 4′ wide. The quartz carries about 1% of sulphurets, said to be high grade. There is an incline 70′ deep, and some drifts have been run. The pumps and hoist are driven by water from the South Yuba Co.'s ditch, delivered to two 5′ Pelton wheels under 125′ pressure. Idle. A. F. Derington et al., of Washington, owners.

*Y. Way Co. Mine* (Placer).—It is ¼ mile S. from Washington. The gravel bank is 20′ high, and the cut 4′ wide and 60′ long. A water-power derrick with 55′ boom is required to remove the bowlders. Twenty-five boxes for washing are used, set on 6″ grade and paved with wooden blocks. Water is taken from South Yuba River. The season lasts eight months. Ten Chinese, owners, are at work.

*Zuver Bros.' Mine* (Drift).—It is on Doolittle Hill, 9 miles N. of Emigrant Gap, at 5,825′ elevation, and comprises 80 acres on the course of an ancient channel, supposed to be the same that has been worked at the Omega Mine. It has a N.E. and S.W. course, and is between 400′ and 500′ in width, with 8′ of gravel, capped by 15′ of cement and 7′ of pipe-clay. There is a 5′ x 6′ bedrock tunnel 800′ long, from which an up-raise of 30′ extends into the gravel. The gangway is driven south across the channel, which is breasted 70′ wide and 6′ high, and timbered with post and cap and lagged overhead. A breaster takes out 20 carloads, of 1,500 lbs. each, per shift. The channel carries considerable water. A second lower tunnel is being started farther north. Wash-water is obtained from South Fall Creek, through 1½ miles of 2′ x 3′ ditch of 900 miner's inches capacity. The tail flume is 2′ wide and 300′ long, and paved with Hungarian riffles, and is cleaned up twice per season; the gold is coarse. Zuver Bros., of Emigrant Gap, Placer County, owners.

## MILLS IN NEVADA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Baltic | Steam | 20 | | | | | | | | |
| Blue Bell | Water | 10 | 850 | 44 | | | | | | |
| Bluejay | Water | 5 | 750 | 10 | | | | | | 135 sq. ft. |
| Brunswick Consolidated | Water | 5 | 800 | 10 | | | | | | |
| Bulldozer | Water | | | | | | | | | |
| California No. 1 | Water | 10 | 750 | 50 | | | | | | |
| California No. 2 | Steam | 10 | 850 | | | | | | | |
| Champion Consolidated | Water | 30 | 850 | 75 | 12 | | 1 | 4 tons. | | |
| Champion Consolidated (new mill) | Water | 40 | 1,000 | 95 | | | | | | |
| Conlan | Steam | 10 | 750 | | | | | | | |
| Coan | Water | 4 | 750 | | | | | | | |
| Crown Point | Water | 10 | 750 | 17½ | 2 | Triumph | | | | |
| Culbertson | Water | 10 | 1,000 | 20 | | | | | | 192 sq. ft. |
| Diamond Creek Consolidated | Water | 20 | 850 | 60 | 4 | Johnson | | | | |
| Delaware | Water | 15 | 850 | 120 | | | | | | |
| Dillon | Water | 4 | 650 | 8 | | | | | | |
| Electrical | Steam | 20 | 1,000 | | 8 | Frue | | | | |
| Empire (no data) | | | | | | | | | | |
| English Mountain | Steam | 20 | 1,000 | 40 | | | | | | |
| Excelsior | Steam | 10 | 900 | 30 | | | | | | |
| Federal Loan | Water | 10 | 850 | 25 | 1 | Triumph | | | | |
| Forlorn Hope | Water | 5 | 750 | | | | | | | |
| Gambrinus | Water | 5 | | | | | | | | |
| Gaston Ridge | Steam | 10 | 750 | 30 | | | | | | |
| German | Water | 10 | 1,000 | 20 | | | | | | 96 sq. ft. |
| Gold Point | Steam | 10 | 1,000 | 20 | 2 | Hendy | | | | |
| Granite Hill | Water | 5 | 850 | 5 | 1 | Woodbury | | | | 120 sq. ft. |
| Harmony | Water | 10 | 850 | 120 | | | | | | |
| Hartery Consolidated | Water | 10 | 850 | | | | | | | |
| Larrimer | Water | 10 | | | | | | | | |
| Last Chance | Steam | 5 | 750 | 7½ | | | | | | |
| Lone Star | Water | 8 | 900 | 16 | 4 | Frue | | | | |
| Malony & Fouch | Water | 2 | 110 | 1 | | | | | | |
| Maryland | Water | 40 | 850 | 80 | 12<br>4 | Frue<br>Triumph | | | | |

MILLS IN NEVADA COUNTY—Continued.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Mayflower | Water | 20 | 900 | 40 | 8 | Frue | | | | |
| Mountaineer | Water | 15 | 850 | 15 | 6 | Frue | | | | |
| Mountain View | | 3 | 1,000 | 7½ | | | | | | |
| National* | Water | 5 | | 22 | 2 | Frue | | | | |
| Nevada County | Water | 10 | 850 | 20 | | | | | | |
| North Banner | Water | 5 | 1,000 | 20 | | | | | | |
| North Star | Water | 40 | 1,000 | 80 | 4<br>12 | Frue<br>Triumph | | | | |
| New Pittsburg | Water | 10 | 1,000 | 20 | 4 | Frue | | | | |
| Omaha Consolidated | Water | 10 | 900 | 16 | | | | | | |
| Original Empire | Water | 40 | 1,000 | 100 | | | | | | |
| Orleans | | 5 | 850 | 9 | 1 | Hendy | | | | |
| Osborne Hill | Steam | 20 | 1,000 | | 8 | Frue & Johnson | | | | |
| Pennsylvania | Steam | 5 | 750 | 8 | 1 | Woodbury | | | | |
| Providence | Water | 40 | 850 | 75–80 | 16 | Frue | 1 | 4 tons. | | |
| Reward | Water | 10 | | | | | | | | |
| Rocky Bar (no data) | | | | | | | | | | |
| Rocky Glen | Water | 10 | 800 | 23 | | | | | | |
| Rogers | Water | 10 | 850 | 15 | | | | | | |
| Rose Hill | Gasoline | 3 | 950 | 5 | | | | | | |
| Slate Ledge | Water | 10 | 750 | 17½ | 2 | Johnson | | | | |
| Southern | Water | 10 | 750 | 15 | 4 | | | | | |
| Spanish (1)* | Water | 10 | 750 | 100 | | | | | | |
| Spanish (2) | Water | 10 | 850 | 25 | 4 | Frue | | | | |
| Stanford | Water | 10 | 950 | 10 | 4 | Frue | | | | |
| Washington | Water | 20 | 850 | 44 | | | | | | |
| West Delhi | Water | 8 | 900 | 15 | 4 | Hendy | | | | |
| W. Y. O. D. | Steam | 20 | 850 | 50 | | | | | | |
| Yuba | Water | 15 | 900 | 30 | | | | | | |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN NEVADA COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Bullion Consolidated | | 1 | Griffin | | | | | | | | |
| Imperial Paint and Copper Co. | | | "Grinding" | | | | | | | | |
| Lone Ridge | | 1 | Arrastra | 8′ | 1 | | | | | | |
| Mount George | Water | | Arrastra | | | | | | | | |
| National | | 1 | Huntington | 5′ | | | | | | | |
| Nevada County Reduction Works | | | Tustin | | | | | 1 | 4 tons. | | |
| North San Juan | Steam | | Huntington | 5′ | | | | | | | |
| Oro Grande | | | PatentGrinder | | 12 | | | | | | |
| Pioneer Reduction Co. | Steam | | Tustin | | 6 | | | 1 | 4 tons. | | |
| Spanish (1) | | | Huntington | | | | | | | | |

## Orange County.

Gold-mining in this county is an industry of little or no importance. Some prospecting, however, is being done near Trabuco Cañon, and in the mountains west of Lake Elsinore some gold prospects have been found. Within the past year several parties were prospecting the brush-covered hill, it having been claimed that rich gold float had been found.

*Shirley Mine* (Quartz).—It is in Trabuco Cañon, 20 miles E. of Santa Ana, at 2,500′ elevation. Two tunnels, 163′ and 215′ long respectively, have been driven into the mountains; several hundred pounds of gold-bearing quartz were found on the surface. John M. Shirley, of Santa Ana, owner.

*Yaeger Mine* (Quartz).—It is near the head of Trabuco Cañon, at 3,500′ elevation. Quite a little prospecting work has been done, and it is claimed gold has been found. G. Yaeger, of Santa Ana, owner.

## Placer County.

Increased activity in mining is noticeable in Placer County. In Ophir District nearly all the mines of prominence are being operated, and there are indications that others will soon be started up, after a long idleness. On the Forest Hill Divide several new enterprises have been inaugurated, and new discoveries recently made in some of the leading old mines indicate the long continuance of active operations in them. East and southeast of the Forest Hill Divide new companies are at work, and are meeting every encouragement. Placer County has a great diversity of resources. The industries of this county are gold-mining, agriculture, horticulture, viticulture, stock-raising, granite-quarrying, pottery manufacture, etc. More or less irrigation is carried on in the foothills, where water can be brought down from the mountains. The valley lands are well supplied by subterranean water, from wells tapped at moderate depths. See our XIth Report, p. 319.

*Adams Mine* (Quartz).—It is 2½ miles S.W. of Auburn, at 1,050′ elevation. A shaft has been sunk 200′ on a small vein. The mine has a steam hoist, but no mill. Flooded and idle. Calvin T. Adams, of Newcastle, owner.

*Allbright Mine* (Drift).—See our XIIth Report, p. 204. It is 2 miles E. of Penryn. Idle.

*Alta Gold Mining Development Co.'s Mine* (Drift).—It is at Alta, at 3,380′ elevation, and comprises the *Alta*, *Bradley & Gardner*, *Deep Blue*, *Erskine*, *Linn*, and S.E. ¼ of Sec. 36. The main working tunnel is 2,900′ in length, and at 2,400′ taps a shaft 180′ deep, through which ventilation is obtained. Formerly a water-blast was employed. Three main cross-cuts have been driven: one, W. of N., is 120′ long, and one S.E. is 216′ long, while the third has just been started; all three are in gravel. When breasting, from 30 to 40 carloads of gravel per day are broken, but the present work is of an exploratory nature. The gravel carries about 60% of bowlders and cobbles, which are mostly stored in the mine. The wash-dump holds 200 cars of 1-ton capacity each, with 400′ of flume set on a 4″ grade, dropping into Cañon Creek, and using about 90 miner's inches of creek water for washing. Eight men are employed. An

ıcorporated company, owner; J. P. Edoff, of 215 Califorina Street, San rancisco, secretary; J. E. Doolittle, of San Francisco, superintendent.

*American Bar Mine* (Quartz).—See our XIIth Report, p. 204. It is 2 iles S.W. of Michigan Bluff, at 1,900′ elevation. It was worked quite xtensively years ago. Active operations are soon to be resumed. The ein strikes N.E. and dips S.E. Three tunnels have been run on the ein. There is a 10-stamp water-power mill on the property. The ompany owns a ditch 3 miles in length. Eighteen men are employed hen the mine is in operation. American Bar Mining Co., of Nevada ity, owner; J. T. McCall, of Michigan Bluff, superintendent.

*Avalon Co.* (*Schipman*) *Mine* (Drift).—It is in Canada Hill District, near Tadpole. The company has secured 2½ miles on a channel which enters and passes out on the north side of Forest Hill Divide. The material of the channel is largely white quartz and bluish slate. Work has only recently commenced, and five men are employed. Avalon Mining Co., of San Francisco, owner; M. H. Worden, of Westville, superintendent.

*Baker Divide Mine* (Drift).—See our VIIIth and IXth Reports, pp. 166 and 29. It is 3 miles E. of Forest Hill. Idle.

*Bald Mountain Mine* (Drift).—It is on the E. side of Bald Mountain, 10 miles S.E. of Westville. Idle.

*Barton Mine* (Drift).—See our XIIth Report, p. 204. It is 3 miles E. of Rocklin. Dr. O. L. Barton et al., of Westville, owners.

*Bella Union Mine* (Quartz).—It is 3½ miles S.E. from Weimar, at 2,000′ elevation. The vein strikes E. of N., and dips 60° E., and consists of a broken mass of slate and quartz about 5′ wide, within slate walls. There are four cross-cut tunnels: No. 1 gives about 70′ of backs;

No. 2 is 40′ long, No. 3 is 120′, and No. 4 is 65′; this latter has to be driven about 35′ farther to reach the vein. Idle. D. Jones, of Clipper Cap, owner.

*Bellevue Mine* (Quartz).—It is 4 miles W. of Auburn, at 2,100′ elevation. It is the west extension of the Bullion Mine. It has a shaft 190 deep. Some new work is now being done on another vein in the property by two men. Edward Trewelling, of Ophir, owner.

*Belvoir* (*Bowlder Extension*) *Mine* (Quartz).—See our XIIth Report, p. 205. It is in Ophir District, 3 miles E. of Auburn, at 1,000′ elevation. A tunnel has been run 800′ on the vein. Idle. J. Kaiser et al., of Ophir, owners.

*Ben Franklin Mine* (Drift).—See our XIIth Report, p. 205. It is near Yankee Jim's on Swindle Hill. Idle. J. N. Burke et al., of Yankee Jim's, owners.

*Big Blue Mine* (Quartz).—It is 3½ miles S. of Gold Run, at 3,050′ elevation, and comprises two claims, designated the *Big Blue* and the *Vulture*. The vein strikes N. and S., and dips E., and is about 5′ wide on the Big Blue and 12′ wide on the Vulture. On the former is a 70′ shaft, and on the latter a 100′ shaft, with two cross-cuts tapping the ledge. Assessment work only. Moody & Gayety, of Gold Run, owners.

*Big Dipper* (*Harmon or Waterhouse*) *Mine* (Drift).—See our VIIIth, Xth, and XIIth Reports, pp. 472, 423, and 205. It is 2 miles S.E. of Iowa Hill, at 3,000′ elevation. The workings have now been extended 3,000′ on the channel. There is no material change to report in the condition of the mine. The surface plant consists of a 10-stamp mill having 950-lb. stamps, and provided with grizzlies and a rock-breaker, and using No. 3 and No. 4 screens, and crushing 100 tons per day. The air-compressor, run by water-power, furnishes air to 3 drills. The mill has both steam and water power. The company runs its own ditch, 10 miles in length, taking water from Shirt-tail Cañon. Forty-five men are at work. Big Dipper Mining Co., of San Francisco, owner; George D. Blood, of Iowa Hill, superintendent.

*Big Oak Tree* (*Milford*) *Mine* (Quartz).—See our VIIIth Report, p. 463. It is 1 mile W. of Colfax, at 2,300′ elevation. Idle. An incorporated company, owner.

*Bishop Mine* (Placer).—It is 1 mile W. of Last Chance, and worked by two men. A. J. Bishop, of Michigan Bluff, owner.

*Black Cañon Mine* (Drift).—It is in Black Cañon, 5 miles S.E. of Westville, and is worked by a small force. — Walford, of Westville, superintendent.

*Black Hawk Mine* (Drift).—It is 3 miles N. of Forest Hill. A tunnel, run from Black Hawk Cañon, has reached the channel recently. W. A. Freeman et al., of Auburn, owners.

*Black Oak Mine* (Quartz).—It is 3 miles S. of Weimar (New England Mills), at 1,875′ elevation, and comprises 25 acres of ground. The 3½′ vein strikes a little E. of N., and dips 60° E., in a slate formation. There are two tunnels; the upper one on the vein is 288′ long, and gives 115′ of backs; the other, 140′ below, is a cross-cut tunnel 150′ to the vein, and turned on it 500′ N. and 225′ S. The quartz carries ½% of sulphurets. There are two pay-shoots on the claim, pitching south. Below the lower tunnel is a 5-stamp mill, run by a 24 H.P. steam-engine; it has 850-lb. stamps, dropped 95 times per minute, and crushing 2 tons to the stamp, with a consumption of one cord of

wood in twenty-four hours. Two men are at work, drifting on an intermediate tunnel. L. P. Drexler, of No. 409 California Street, San Francisco, and G. D. Wyman, of Applegate, owners; J. T. Judd, of Weimar, superintendent.

*Blue Cañon Mining and Development Co.'s Mine* (Drift).—It is on the N.W. ¼ of Sec. 22, between Blue Cañon and Shady Run stations, at 3,900′ elevation, and comprises 1 mile along the main lava divide, between the North Fork of American River and Bear River. A tunnel has been started in the bedrock, 600′ below the railroad track, and is now 120′ in length, and will have to be extended 1,800′ farther. Four men work, on two shifts. An incorporated company, owner; J. B. Knapp, of Blue Cañon, secretary.

*Bob Lewis Mine* (Drift).—It is 2 miles S.E. of Damascus, and lies parallel with the Mountain Gate Mine. Idle. Estate of Robert Lewis, of Damascus, owner.

*Bowen Mine* (Drift).—It is 2 miles N.E. of Michigan Bluff, at 3,400′ elevation. There are three separate channels in the property. That on the eastern side is opened 1,000′ along the channel, and the indications are that it may be a portion of the Weske channel—the gravel is similar and the tufaceous capping is identical, being characterized by numerous cavities, or vuggs filled with a soft, mushy material of light color. The second channel is broad, and filled with great bowlders resembling the Manhattan channel of the Weske property. The third channel is higher than either of the former, and is now being worked, with good results, through a gangway 1,000′ long. There is no mill on the property, as the gravel is free. Six men are at work. A. C. Bowen, of Michigan Bluff, owner; F. A. Bowen, of Michigan Bluff, superintendent.

*Bowlder Mine* (Quartz).—See our XIIth Report, p. 205. It is 3 miles W. of Auburn, at 950′ elevation. The vein strikes N. 40° E., and dips 45° S.W. An inclined shaft has been sunk 250′, with water-power hoist. The mill has 8 stamps and one 6′ Johnston concentrator. The sulphurets average about 2½%. The vein is of good size, though not rich. Its characteristics are similar to those of other mines in Ophir District. Nineteen men are at work. D. H. Atchison et al., of Marshfield, Oregon, owners; C. C. Handy, superintendent.

*Breece & Wheeler* (*Paragon*) *Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 467, 29, 455, and 206. It is at Bath, 1½ miles N.E. of Forest Hill, at 2,900′ elevation. This mine was formerly operated on a large scale, but has of late years been worked in a smaller way, by lessees. The workings have been connected with those of the Mayflower Mine, making 4½ miles of continuous workings on this famous channel. A large portion of the upper lead of this channel remains unworked, as also a cross-channel known as the Orono, which also is being worked in the Mayflower ground. The property is equipped with a 10-stamp steam-power mill. Ventilation in the mine is effected by means of a blower, run by an overshot water-wheel, the water from the mine being used for this purpose. Twenty men are employed. Breece & Wheeler, of San Francisco, owners; W. H. Grennell, of Bath, superintendent.

*Bullion Mine* (Quartz).—It is on Bellevue Hill, 4 miles W. of Auburn, at 1,240′ elevation. After a long idleness, the mine is being reopened. There are two shafts, 100′ and 150′ deep, respectively, on a vein which strikes N.E., and dips 65° S.W. There is a small steam hoist on the mine. Five men are working. N. Waring, of Ophir, owner; J. C. Rood, of Ophir, superintendent.

*Burns Mine* (Drift).—It is ½ mile N. of Michigan Bluff, and is opened by a bedrock tunnel 800′ in length. Worked by two men. Burns Bros. of Michigan Bluff, owners.

*Buttes Mine* (Quartz).—See our VIIIth Report, p. 461. It is ¾ of a mile S.W. of Ophir. The vein strikes E. and W., and dips 45° S. Idle.

*Calf Pasture Mine* (Quartz).—It is 3½ miles N. of Auburn. It has a shaft 226′ deep, from which three levels have been driven. The vein strikes E. and W., and dips nearly vertically. There is a steam hoist on the mine, but no mill. Idle. B. F. Meyers, of Auburn, owner.

*California Mine* (Quartz).—It is 4 miles W. of Auburn. Worked extensively years ago, but now idle and dismantled. The deepest shaft, said to be 300′, is caved. Francis Fellows, of Ophir, owner.

*California Mine* (Quartz).—It is in Baltimore Ravine, 2½ miles S.W. of Auburn. It is a prospect, with superficial work. One man working. — Hubbell, of Auburn, owner.

*Cañon Creek Tailings Mine* (Placer).—It is 1 mile E. of Gold Run, at 2,900′ elevation, and comprises 1½ miles in length and the width of the cañon. All the former hydraulic works of the Gold Run side emptied into this creek; it has been worked down to the old, original gravel, through 25 sluice-boxes 14″ wide, and set on an 8″ grade. Cañon Creek furnishes the water. Twenty men are employed. J. Stewart and J. L. Gould, of Dutch Flat, owners.

*Cedar Creek Mine* (Drift).—See our XIIth Report, p. 206. It is 1 mile S. of Shady Run, at 3,500′ elevation, and comprises 460 acres along 1½ miles of an ancient channel, having a N. 30° W. course. A bedrock tunnel, 780′ long, was 14′ too high. A second one, started 60′ perpendicularly below, is now 250′ long and will extend to 760′, where an upraise will connect with the upper tunnel; it is furnished with steel T rails, and ventilated by water-blast with 7″ air pipes. The gravel is free white quartz, said to average $2 40 per car of 1-ton capacity, and is breasted 40′ wide, 5′ high, and timbered with post and cap. A breaster takes down 6 cars per shift, picking up 2′ of bedrock. The ground is somewhat swelling. The tail-flume is 500′ long, 14″ wide, set on an 18″ grade, and is in several sections, with 20′ drops. The dump is in a cañon leading to the American River. The first three boxes are cleaned up every day. Five men are employed. An incorporated company, owner; D. McDonald, of 306 Market Street, San Francisco, secretary; A. Rogers, of Towles, superintendent.

*Champion Mine* (Quartz).—See our XIIth Report, p. 206. It is 1½ miles N.E. of Michigan Bluff. There are two tunnels, 150′ and 200′ long, respectively, and a 40′ incline. No machinery. Worked by C. Knopfel, of Michigan Bluff, owner.

*Cherokee Mine* (Quartz).—See our XIIth Report, p. 206. It is 12 miles N.E. of Michigan Bluff and 2 miles N.E. of Last Chance. No work of consequence has been done since our last Report. A. Dixon, of Michigan Bluff, owner.

*Chinese Co.'s Mine* (Placer).—It is at Indiana Hill, where the American River cuts the Gold Run channel, at 2,700′ elevation, and comprises 20 acres. Twenty Chinese working.

*Cochrane Mine* (Hydraulic).—It is on the south side of Long Cañon, 16 miles S.E. of Michigan Bluff. Preparations are being made to hydraulic with 400 miner's inches of water under 100′ head. Four men are employed. M. Cochrane, of Michigan Bluff, owner.

*Columbia Gold and Silver Mining Co.'s* (*Three Stars*) *Mine* (Quartz).—See our XIIth Report, p. 206. It is in Ophir District, 7 miles W. of

Auburn, at 500′ elevation. The property is well equipped with hoisting and milling plant, etc., but is idle. B. F. Hartley, of Auburn, superintendent.

*Crater Hill Mine* (Quartz).—See our Xth and XIIth Reports, pp. 433 and 207. It is on Crater Hill, 4 miles W. of Auburn. Said to have been worked to a depth of 800′, but now idle and the hoist falling into decay.

*Dahlonega Mine* (Quartz).—It is 2 miles S. of Emigrant Gap, at 5,350′ elevation, and comprises one claim. The 2½′ vein strikes N.E., and dips S.E., in slate, the quartz being well mineralized. Three tunnels have been driven; No. 1 is 50′ long, No. 2 is 140′, and No. 3, the lowest, has not yet reached the vein and is 290′ long. The ground above the upper tunnel has been stoped to the surface. Below the tunnels is an 8-stamp team-power mill, with 850-lb. stamps. Idle temporarily. H. H. Teal, of Emigrant Gap, and J. A. Hoagland, 1214 J Street, Sacramento, owners.

*Dam Mine* (Drift).—See Hidden Treasure.

*Damascus* (*Mountain Gate*) *Mine* (Drift).—See Hidden Treasure. Six men are employed, cleaning out old works.

*Daniel Webster Mine* (Quartz).—See our XIIth Report, p. 207. It is ½ miles N.E. of Michigan Bluff. The vein strikes N. and dips 75° E. Formerly a producing mine, but now only represented by annual assessment work. Mrs. S. A. Powell, of Michigan Bluff, owner.

*Dardanelles Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 464, 29, 465, and 207. It is 1½ miles S.W. of Forest Hill, at 3,600′ elevation. It was formerly one of the leading mines of the county, but it is now worked in a small way by tributers. The mine is equipped with a 5-stamp mill, provided with both water and steam power. The capacity is 8 tons per stamp during twenty-four hours' run. Six men are working. Ownership in dispute. A. S. Votair, of Forest Hill, agent.

*Dewey & Stocker Mine* (Quartz).—It is 2 miles N.E. of Forest Hill, near Bath. A cross-cut tunnel is being driven by 2 men, to cut the vein. Dewey & Stocker, of Forest Hill, owners.

*Dorrer Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 468 and 207. It is in Humbug District, 2 miles N.W. of Damascus, at 3,400′ elevation. The vein strikes N.W., and dips 80° S.E. Six men are engaged in prospecting. A. E. Franzell, of Towles, owner.

*Drummond Mine* (Quartz).—See our Xth and XIIth Reports, pp. 424 and 208. It is near Sugar Pine Mills, 8 miles N. of Forest Hill. There are two veins in the property, on each of which there is considerable work. A new tunnel is being run by 6 men under contract, this being the only work in progress at present. Hon. C. F. Reed, of Auburn, owner.

*Eclipse and Good Easter Mines* (Quartz).—See our Xth Report, p. 433. This property comprises a group of ten claims in Ophir District, at 1,000′ elevation. The vein strikes E., and dips 30° to 45° S. The main shaft is 297′ deep, with three main levels, at 200′, 250′, and 297′, respectively; drifting has been commenced at the bottom of the shaft in good ore. The hoist is run by water-power, using 60 miner's inches of water under 168′ head. The mill, also run by water-power, has 10 stamps of 850 lbs. each, which drop 5″ and 104 times per minute. The discharge is 7″ high. There are no concentrators in use. The sulphurets

are saved on a series of riffles. Fifteen men are working. Eclipse Mining Co., of Auburn, owner; W. De Varilla, of Auburn, superintendent.

*Elite Consolidated Gold Mine* (Drift).—It is at Shady Run, on North Fork of American River, at 3,950′ elevation, and comprises three claims of about 400 acres. This is a prospect to develop an ancient channel supposed to pass through the ridge. A tunnel has been driven 1,100′, with an incline at the back 158′ long, the last 25′ of which is in quartz gravel carrying a little fine gold. The bedrock is slate. Only assessment work is being done. R. Monroe et al., of Dutch Flat, owners.

*Eureka Mine* (Drift).—It is 3 miles N. of Sunny South, at 4,400′ elevation, and comprises 3,600 acres and 6 miles on the Dick channel. There are a number of old shafts and tunnels, the longest of which is 1,480′ without reaching the channel. The present tunnel is 7′x 7′, and is now 1,340′ long. It is being actively driven ahead at the rate of 170′ per month, with machine drills. It will require 470′ more to reach the channel, which was prospected by bore-holes. An 80 H.P. boiler and compressor furnish the power. Two hundred inches of free water may be obtained from East El Dorado Cañon through 1¼ miles of ditch. Twelve men are employed. Eureka Consolidated Drift Mining Co., owner; Felix Chappelet, president; D. M. Kent, of No. 330 Pine Street, San Francisco, secretary; Felix Chappelet, Jr., superintendent.

*Flat Ravine Mine* (Quartz).—See our XIIth Report, p. 208. It is on the south side of Bald Mountain, near Flat Ravine. Assessment work only is performed, annually. M. Savage, of Michigan Bluff, owner.

*Franklin Mine* (Drift).—It is 2 miles N.E. of Michigan Bluff, at 3,400′ elevation. Idle. A. Dixon, of Michigan Bluff, owner.

*Glen Consolidated* (*Gray Eagle*) *Mine* (Drift).—It is near Bald Mountain, 6 miles N. of Last Chance, at 5,600′ elevation. This company has 3 miles along the presumed course of an ancient channel which is capped with tufa and andesite bowlders. A cross-cut tunnel has been run through cement (volcanic ash) 200′ to the channel, which is an upper lead. The "bedrock" channel is 150′ lower, and has not been opened at all. Surface plant, consisting of large water-tank, flume, etc., is being put in place, preparatory to washing the gravel. It is a new enterprise, for which the outlook is promising. Five men are employed. Glen Cons. Gravel Mining Co., of Forest Hill, owner; J. Shields, of Michigan Bluff, superintendent.

*Gold Blossom Mine* (Quartz).—See our Xth and XIIth Reports, pp. 431 and 209. It is on Crater Hill, 4 miles W. of Auburn, and comprises 5,800′ on the lead which forms a junction of the Crater Hill vein and the Gold Blossom vein, in the mine of the latter name. There are three claims: *Back Action*, having 1,000′; *Gold Blossom*, 1,800′, and *Gold Blossom No. 2*, 3,000′, on the lode. The vein strikes E. and W., and dips 85° S. The shaft is sunk at this angle, and is 220′ deep. A tunnel has been run 100′ to the vein on the Gold Blossom No. 2, and a drift run 450′ along the vein, besides which there is some superficial work. On the Gold Blossom No. 2 is a 10-stamp water-power mill with stamps of 950 lbs. each. The mill is used in milling quartz from each of the mines of the group. On the original Gold Blossom is a 10-stamp mill having a lot of accessory machinery, including revolving steel barrels, with electric attachment, a rotary roaster, mercury traps, etc., all designed to work what was considered an unusually refractory quartz. The machinery was given a trial and the process abandoned, as better results are obtainable by a process of careful amalgamation and concentration. Fifteen

men are employed. Hon. C. F. Reed, of Auburn, owner; J. L. Grimes, superintendent.

*Golden River* (*Red Point*) *Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 470, 29, 456, and 208. It is 1½ miles S.E. of Damascus. During the past two years the breasts have been advanced 2,000′ up stream. The face is now 1¾ miles from the mouth of the tunnel. Ventilation is secured by means of a No. 4½ blower driven by water-power. Fifty-eight men are employed. Golden River Mining Co., of Paris, France, owner; Charles F. Hoffman, of Damascus, superintendent.

*Golden Scepter* (*Ellen Dip*) *Mine* (Quartz).—It is in Sec. 3, T. 13 N., R. 9 E., 2½ miles S. of Weimar, at 1,625′ elevation at top of the claim and 1,235′ on the creek level, and comprises 84 acres. The auriferous belt lies along the irregular contact of slate and serpentine, the latter intruding short spurs into the former, along which seams are worked. The heaviest body of quartz trends N. 37° W., with nearly a perpendicular dip, and shows a width form 2′ to 20′. The surface was formerly hydraulicked, but is opened now by three tunnels, 130′, 50′, and 90′ in length, and a 16′ shaft. Two men are employed. F. Ephraim and Mrs. Phillips, of San Francisco, owners; R. H. Young, F. F. Woodworth, and J. E. Farrel, of Weimar, lessees.

*Golden Shaft Mine* (Drift).—It is in Dutch Flat, at 3,175′ elevation, and comprises 8½ acres. There is a 4′x 6′ double-compartment shaft, 100′ deep in gravel, with 100′ of gangway; the breasts are taken 6′ high and 40′ wide in a blue gravel carrying 33% of bowlders. A water-power hoist and a 3″ Cornish pump are placed at the shaft. There is an 8-stamp water-power cement mill, with 950-lb. stamps, run at 95 drops, with a crushing capacity of 56 tons per day, and 300′ of sluices. Eighty miner's inches of water are furnished by the South Yuba Ditch Co., under 130′ head. E. Mallows, of Dutch Flat, owner.

*Gold Ring Mine* (Drift).—It is in Green Valley, on the American River, 2½ miles S.E. of Towles, at 1,500′ elevation, and comprises 63 acres on an ancient channel, having a N. and S. course. Twelve hundred feet have been worked on the west rim, the east rim not having been touched. The workings, started where the channel broke out on the west rim, are 8′ high and with 30′ breasts, the cemented gravel being crushed in a 10-stamp water-power mill, with 850-lb. stamps, of 40 tons capacity per day. Forty inches of water are taken from Giant Gap Cañon, through ¼ mile of ditch, and applied under 200′ pressure. A water-power hoist is employed to raise the gravel to the top of the mill. The east rim is to be worked on the same level through a new tunnel carried half in the serpentine bedrock. Thirty men are employed. An incorporated company, of Oakland, owner; A. Ames, of Towles, superintendent.

*Gold Run Mining and Ditch Co.'s Mines* (Hydraulic).—See our XIIth Report, p. 209. They lie between Dutch Flat and the American River, at 3,175′ elevation, and comprise about 7 miles of ground. An incorporated company, owner; J. L. Gould, of Dutch Flat, manager.

*Good Easter Mine* (Quartz).—See Eclipse.

*Gray Eagle Mine* (Drift).—It is 5 miles N.W. of Forest Hill. This mine has an air-shaft 360′ deep. When sunk it was presumed to be in the channel. A bedrock tunnel was then run from the north side of the Forest Hill Divide, but when it reached the gravel it was learned a mistake has been made and that the shaft, though on bedrock, was not in

the channel. The tunnel was then turned up stream and has been run several thousand feet in that direction—the tunnel is now 8,000′ in length. Ventilation is secured by means of a blower, driven by water-power. At 80′ from the surface in the shaft a heavy flow of water was encountered, and is taken up and carried by pipe to the bottom of the mine, where the blower is located. The mine is provided with a 10-stamp steam-power mill, which is usually run twelve hours a day. Twenty-eight men are employed. Gray Eagle Gravel Mining Co., of San Francisco, owner; George During, of Forest Hill, superintendent.

*Green Mine* (Quartz).—See our XIIth Report, p. 209. It is on Crater Hill, near Ophir. Idle.

*Harmon Mine* (Drift).—See Big Dipper.

*Hathaway Mine* (Quartz).—See our Xth Report, p. 429. It is in Ophir District, 3½ miles S.W. of Auburn, at 760′ elevation. The vein strikes N. 75° W., and dips 75° southerly. The main shaft is now 456′ deep, and sinking will be continued to 600′ in depth. There are also three other shafts, 75′, 100′, and 125′ deep, respectively, none of which are in use. There are between 3,000′ and 4,000′ of levels open, and considerable stoping has been done. Both hoist and mill are run by water-power. The mill has 20 stamps and is provided with 4 concentrators. The sulphurets average about 2%, consisting of galena, blende, pyrite, marcasite, chalcopyrite, and occasionally tetrahedrite (gray copper). Fifty men are employed. Hathaway Gold Mining Co., of San Francisco, owner; Asa B. Eastwood, of Newcastle, superintendent.

*Haub Mine* (Drift).—It is ½ mile E. of Shady Run Station, at 3,720′ elevation, and comprises 33 acres on an ancient channel. There is a tunnel, 965′ long, with a 30′ perpendicular upraise at the end and a 60′ slope into the channel, carrying white quartz gravel, with 50% of cobbles and bowlders, which are stored in the mine. The breasts are carried 5′ high and 40′ wide, and are timbered in sets. One breaster can break down 5 cars, of 13 cu. ft. each, in a shift. The mine is ventilated with a water-blast of 20′ drop, and 960′ of 6″ pipe. Wash-water is obtained from springs; the tail flume consists of 11 boxes, 12″ wide, set on a 11″ grade, and drops into Shady Run Cañon. Four men are employed. C. Haub, of Blue Cañon, owner.

*Herman (Osborne) Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 472 and 211. It is 6 miles N. of Deadwood, at 5,000′ elevation. Two tunnels, 150′ and 500′ long, respectively, have been driven on the vein, and a cross-cut tunnel has been driven 300′ to the vein and a drift run along the vein several hundred feet. These three levels are connected, and considerable stoping done on each of them. The vein strikes N., and dips 70° E. It is irregular and illy defined, the walls being a slaty rock, accompanied with a dike of indeterminable character, very much decayed. The management contemplates driving another cross-cut tunnel, 1,300′ in length, which will cut under the present lowest level nearly 500′. The steam-power mill has 10 stamps of 1,000 lbs. each, and is provided with 4 Union concentrators. Thirty-two men are at work. Herman Mining Co., of San Francisco, owner; Dr. O. L. Barton, of Westville, superintendent.

*Hermit Mine* (Drift).—This property includes the *Gould*, *Hermit Nos. 1 and 2*, *Hill & Hansen*, and *O'Donnell* claims, and is 2½ miles N.E. of Michigan Bluff, at 3,400′ elevation. A tunnel has been driven 1,900′ into the mountain, in a northwesterly direction, with a view of prospecting the ground, and particularly in hope of encountering the famous

Red Point channel. At present an upper lead of free-washing gravel is being worked by lessees. The new drift is in 300′, and is connected by a winze with the main tunnel below. The upper lead is 75′ higher than the tunnel. Two men are working. F. A. & A. C. Bowen, of Michigan Bluff, owners.

*Hidden Treasure Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 469, 29–120, 451, and 209. It is at Sunny South, 4 miles N. of Michigan Bluff, at 3,700′ elevation. The mines comprised in this group are the *Cameron*, *Hidden Treasure*, and *Mountain Gate*, on the great Damascus or Sunny South channel, and the *Dam*, on the Dam channel. Years since the Hidden Treasure and Mountain Gate were worked extensively, first on the west side, and later the Hidden Treasure was worked on the east side. The east side of the Mountain Gate is intact and preparations are now being made to reopen and work on the east side of that mine also. The Dam tunnel has progressed several thousand feet since last referred to in our Reports. The workings reached a point in front of the north end of the old workings of the Hidden Treasure, but 30′ lower than the latter. It has been found that the Dam channel is swinging more to the eastward than was anticipated. A drift was run northwesterly in the hope of encountering the Red Point channel. A 30′ raise was made, and the white gravel of the famous Hidden Treasure channel encountered. It is evidently a remnant lying between the north end of the Hidden Treasure and the south end of the Mountain Gate. How extensive it will prove to be cannot be surmised at this time. A new *curved* drift is being driven, on a uniform gradient, to connect with the new upper level and thus dispense with the chute, which is not at all satisfactory. Thus far no trace has been found of the Red Point channel, but it is believed it will yet be found beyond the Hidden Treasure channel. The section lying in the gap between the Hidden Treasure and Mountain Gate mines has long been regarded as most puzzling, and even now it is not entirely clear. The relation of the several channels will not be definitely known until they have been practically worked out. About 200 men find constant employment here. Hidden Treasure Mining Co., of Michigan Bluff, owner; Harold T. Power, of Michigan Bluff, superintendent.

*Hogsback Mine* (Drift).—See our VIIIth Report, p. 472. It is 3 miles N. of Westville, at 4,850′ elevation. It has a long bedrock tunnel. Idle.

*Horseshoe Bar Mine* (Placer).—See our IXth Report, p. 277. It is on the Middle Fork of the American River, 2 miles S.W. of Michigan Bluff. A bedrock tunnel was driven through a spur of the ridge, just below the bar, some years since. A contract was recently let to construct 5 miles of ditch and flume from El Dorado Cañon, and delivering the water at a point 400′ above the mine. The gravel, etc., will be raised by hydraulic elevators. Horseshoe Bar Mining Co., owner; — Stevens, of Michigan Bluff, superintendent.

*Huntville Consolidated* (*Mosquito*) *Mine* (Quartz).—It is near the head of Mosquito Creek, 14 miles N.E. of Michigan Bluff. The vein strikes N.W., dips 70° N.E., and varies greatly in width. The developments consist of a shaft sinking to 100′ with a windlass. At 52′ from the surface a cross-cut has been driven. Besides, there is some superficial work. Five men are working. Huntville Consolidated Mining Co., owner; W. Searing, of Michigan Bluff, superintendent.

*Julia Mine* (Quartz).—It adjoins the Pioneer Mine, and is 1½ miles N.E. of Damascus. It is 4′ wide, strikes N., and dips 80° E. A tunnel

has been driven 80′ on the vein, and a cross-cut tunnel run 700′ to the vein, and a drift has been run 60′ along the vein, giving 250′ of backs. Two men are at work. J. D. Sullivan, of Towles, owner.

*Kittler Mine* (Quartz).—It is 4 miles W. of Auburn, at 1,000′ elevation. The vein strikes E., and dips 45° S. A tunnel has been run 400′ on the vein, connecting with an inclined shaft 150′ to the surface. Some stoping has been done and a series of superficial cuts made along the vein for a distance of 400′, on what is presumed to be the pay-shoot. The quartz is similar to that of others in Ophir District. Some of it has been rich enough to ship to the smelters. There is no machinery on the mine. B. M. Berry et al., of Auburn, owners.

*Lady Bedford Mine* (Quartz).—See our XIIth Report, p. 210. It is 10 miles E. of Michigan Bluff. The mine is in successful operation, though having only a 2-stamp mill. Three men are working. Page & Buckman, of Michigan Bluff, owners.

*Live Oak Mine* (Drift).—See our VIIIth Report, p. 474. It is 2 miles N.W. of Forest Hill. Idle.

*Lofroth Mine* (Drift).—It is at Deadwood, worked in a small way by the two owners. Lofroth & Meyers, of Deadwood, owners.

*Lost Camp Mine* (Hydraulic and Drift).—It is 1½ miles S.E. of Blue Cañon, at 4,500′ elevation, and comprises 600 acres on an ancient channel with a N.W. course and averaging 500′ in width. The gravel is 120′ deep and is hydraulicked. A 300′ tunnel runs through slate bedrock into the gravel, which carries quartz and coarse gold. Three hundred miner's inches of free water are obtained for three or four months in the year from Blue Cañon, through a 2-mile ditch, and delivered to a giant with 4″ nozzle, under 200′ head. The tail flume is 200′ long, 3′ wide, paved with block riffles, and dumps into Woods Ravine, where there is a log and brush dam 60′ long and 25′ high. When drifting the gravel is breasted 6′ high and 12′ to 20′ wide, yielding 6 cars of ½ ton each to the breaster, per shift. The breasts are timbered with sets, and the 60% of bowlders are stored in the mine. The dirt is washed through 150′ of 18″ flume set on a 6″ grade, and paved with blocks; it is cleaned once a week. Four men are employed. J. Rathborn et al., of Blue Cañon, owners.

*Lundquist Mine* (Quartz).—It is a prospect in Auburn Ravine, 2 miles S.W. of Auburn. Idle. Mrs. Lundquist, of Auburn, owner.

*Lynn Mine* (Quartz).—See Pioneer.

*Malmsberg Mine* (Quartz).—It is 2 miles S.W. of Auburn, at the foot of Baltimore Ravine. A tunnel has been run on the vein a few feet, and two shafts, 50′ and 60′ deep, respectively, sunk on it. A 5-stamp mill is in process of construction. Johnas Malmsberg, of Auburn, owner.

*Mammoth Bar Mine* (Placer).—See our IXth, Xth, and XIIth Reports, pp. 280, 417, and 210. It is on the Middle Fork of American River, 5 miles E. of Auburn. It is worked by hydraulic elevators, and was one of the first mines in the State to successfully apply this method of mining. Since our last Report part of the head of water has been utilized to run a dynamo, furnishing ample light for working nights. Col. Davis, of Auburn, owner.

*Manhattan Mine* (Drift).—See Weske.

*Marguerite Mine* (Quartz).—See our XIIth Report, p. 210. It 1¼ miles N. of Auburn, at 1,360′ elevation. The vein strikes N.W. and dips 80° S.W. The shaft is now 310′ deep. The quartz con-

ains a considerable quantity of mariposite, an uncommon occurrence n this district. The surface plant consists of a steam hoist and a gasoline-engine to run a 4″ jackhead pump. There is no mill. Nine nen are working. Marguerite Gold Mining and Milling Co., of San Francisco, owner; Fred Deetkin, of Auburn, superintendent.

*Mayflower Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 457, 29–120, 453, and 210. It is 1½ miles N. of Forest Hill, at 2,700′ elevation. The Orono channel, which crosses the Paragon and Mayflower mines, is at present furnishing the principal supply of gravel now being worked. Several bore-holes and a shaft sunk in the Mayflower have determined the upper lead to be continuous and gold-bearing. There is about two miles of this lead comparatively unexplored, and it is believed it can all be worked to a profit. This will give a new lease of life to this famous mine. The underground workings of the Mayflower and Paragon have been connected, and now form a continuous exposure on the channel 4½ miles in length. The surface equipment consists of a 20-stamp water-power mill, crushing 160 tons per day, using a ¼″ screen. Ninety men are employed. Mayflower Gravel Mining Co., of San Francisco, owner; A. D. Gassaway, of Forest Hill, superintendent.

*Monumental and East Fork Mine* (Drift).—It is 4 miles E. of Emigrant Gap, at 4,725′ elevation, and comprises 160 acres. The workings are on the old Monumental channel, which has a general N.E. course, and is capped with pipe-clay. Shallow shafts are sunk on both claims, 25′ and 10′ deep, near the banks of the creek, requiring the placing of an ejector. As soon as the water is brought under control a drift will be started over to the channel. The claim lies on the flank of Texas Hill, and carries heavy wash, much water, and coarse, nuggety gold. Six men are employed. Dr. J. Manson et al., of Towles, owners.

*Moody Ridge Mine* (Drift).—It is 2 miles E. of Gold Run, at 3,650′ elevation, and comprises 120 acres of patented ground. A bedrock tunnel is being run, through diabase, to tap a channel supposed to have a N.E. course; it is now 45′ in length, and will have to be extended 30′ to cut through the rim. R. Brown and J. J. Speikel, of San Francisco, are working under a bond. Moody Bros., of Gold Run, owners.

*Moore Mine* (Quartz).—It is in Ophir District, 2 miles S.W. of Auburn, at 1,050′ elevation. The vein strikes E. and W., and dips 45° S. The pay-shoot, however, tends eastward along the vein, and the 300′ shaft is sunk with the pitch of the shoot—a most unusual thing. The quartz is crystallized, and contains gold and auriferous sulphides of iron, copper, lead, and zinc. There is a steam hoist, but no mill. Four men are at work. White & Thorp, of Ophir, owners; J. W. White, of Ophir, superintendent.

*Morning Star Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 472, 29, 420, and 211. It is at Iowa Hill, at 3,000′ elevation. The mine is working steadily, under the same favorable conditions as have obtained for years. The mill has 10 stamps, furnished with both steam and water power. Sixty men are employed. Morning Star Mining Co., of Colfax, owner; Hon. J. H. Neff, of Colfax, superintendent.

*Mosquito Mine* (Quartz).—See Huntville Consolidated.

*Mountain Gate Mine* (Drift).—See our VIIIth and IXth Reports, pp. 468 and 29. See Hidden Treasure.

*New Baccarat Gravel Mine* (Drift).—It is on leased ground, 3 miles

S.E. of Lincoln, in Sec. 23, T. 12 N., R. 6 E., at about 160′ altitude. Ten prospect shafts, 4′ to 5′ in diameter and 25′ to 80′ deep, have been sunk to bedrock, and two drifts, 150′ and 175′ long, have been run. Water from the South Yuba ditch will be used. Four men are employed in developing. J. I. Felter, of Sacramento, secretary; A. V. Oliver, of Lincoln, superintendent.

*No Chunk Mine* (Quartz).—It is a prospect, ½ mile W. of Michigan Bluff. The decomposed country rock and quartz have been sluiced off on the surface. Two men are at work. G. E. Hill et al., of Michigan Bluff, owners.

*Number Two Mine* (Quartz).—It is 3½ miles S. of Gold Run, at 2,875′ elevation. The vein strikes N. and S., and dips E. between slate and porphyry, and is 12′ wide, carrying two parallel stringers. There is an 80′ tunnel, giving 60′ of backs, and a shaft 40′ deep on the vein. Only assessment work is being done. Moody & Gayety, of Gold Run, owners.

*Old Pacific Mine* (Quartz).—See our XIIth Report, p. 211. It is in Ophir District, 4½ miles W. of Auburn. Idle. D. Schnabel, of Newcastle, owner.

*Ophir District.*—See our Xth Report, p. 427. The mines of the district are fissures, in grano-diorite, diabase, and serpentine. The ores of the district have long been called refractory, though their physical appearance suggests a simple process of amalgamation and concentration, and indeed, very good work is now being done at several mills in the district proving this to be true. A large amount of money has been expended on processes, machinery, furnaces, etc., all of which are unnecessary. The gangue is quartz containing sulphides of iron, lead, zinc, copper, and, more rarely, gray copper (tetrahedrite). There has been a general revival of mining in Ophir District, and nearly all the mines of prominence are again at work, after an idleness of many years.

*Oro Mine* (Drift).—It is 2½ miles N.E. of Michigan Bluff. A tunnel run 4,000′ into the hill years ago has been bulkheaded, and is now used as a reservoir for water. Idle. Mrs. A. Dixon et al., of Michigan Bluff, owners.

*Osborne Mine* (Quartz).—See Herman.

*Paragon Mine* (Drift).—See Breece & Wheeler.

*Pioneer Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 468 and 211. This property includes the *Lynn* and *Pioneer* mines. It is 1 mile N.W. of Damascus, at 3,800′ elevation. There are two veins 900′ apart, and approximately parallel. The strike is a little E. of N., and the dip 80° E. The mine is opened by three cross-cut tunnels, the main or lower tunnel being 1,400′ long. On this level the main drift is 2,500′ in length. There are several hundred feet of ground open on each tunnel level, and considerable stoping has been done. Five hundred and twenty feet below the present main cross-cut, a new tunnel is being driven to the vein, under contract. A hoisting plant has been set up in the station on the main tunnel level, and a winze is now being sunk to the 1,000′ level, to connect, by means of a drift, with the new cross-cut now being driven. The quartz is sent in cars on a 2,700′ tramway to the mill, 1,100′ below. The 20-stamp mill, of 850 lbs. each, is supplied with eight Frue vanners and a canvas table of 800 sq. ft. of surface. From 35 to 200 inches of water from Damascus Cañon—according to season—is carried in the company's ditch, 2 miles in length, and delivered at the mill under 65′ pressure. Forty men are employed. Pioneer Gold

Mining Co., of Boston, Mass., owner; J. D. Sullivan, of Towles, superintendent.

*Red Point Mine* (Drift).—See Golden River.

*Red Rock Mine* (Quartz).—It is 2 miles S.E. of Blue Cañon, at 4,450′ elevation, and contains 160 acres. The vein strikes N. 25° E., and dips 37° S.W., varying in width from 5′ to 12′ between slate walls, in a porphyry belt, intersected with quartz seams. Tunnel No. 1 cross-cuts 220′ through the slate, and turns 200′ S. on the vein and 50′ N., where some stoping has been done. Former owners worked out a large open cut on the outcrop of the vein. A new 10-stamp water-power mill, furnished with two Union concentrators, has just been completed, but is not yet running. Free water from the north branch of North Fork of the American River is delivered through 540′ of 11″ pipe to a 4′ Pelton wheel, under 290′ pressure. An incorporated company, of Philadelphia, owner; Governor N. B. Willey, of Blue Cañon, superintendent.

*Rising Sun Mine* (Quartz).—See our VIIIth Report, p. 462. It is 1 mile N.W. of Colfax, at 2,290′ elevation. Idle, on account of litigation.

*Sailor Cañon Mine* (Drift).—See our Xth Report, p. 426. The tunnel started some years since has reached gravel, and 3 or 4 men are at work in the mine. It has not been extensively opened as yet. Sailor Cañon Gravel Mining Co., of San Francisco, owner; — Denton, of Westville, superintendent.

*Salsic* (*Smith & Fulweiler*) *Mine* (Quartz).—See our XIIth Report, p. 212. It is a prospect, ¾ mile N.W. of Auburn. Two men are at work. Smith & Fulweiler, of Auburn, owners.

*Secret Town Mine* (Quartz).—It is 3 miles S. of Gold Run, at 2,875′ elevation. The 2′ vein strikes N.W. and dips 60° N.E. in a slate formation. There are two shafts, 35′ and 40′ deep, respectively, and a 20′ tunnel that ultimately will cut the vein at 150′ depth. Only assessment work done. Moody & Gayety, of Gold Run, owners.

*Sellier Mine* (Drift).—It is 2½ miles N.E. of Michigan Bluff. A tunnel is being driven to reach a channel under the Forest Hill Divide. J. B. Sellier, of Michigan Bluff, owner.

*Shaw Bros.' Mine* (Drift).—It is ½ mile S. of Alta, at 3,500′ elevation, and comprises 500′ on the Alta channel. A bedrock tunnel has been driven 300′ in rotten granite, and continued 60′ in gravel, which is from 3′ to 4′ high, with a pipe-clay capping. The quartz gravel is cemented. From 8 to 10 carloads (1,500 lbs.) of gravel are extracted per shift, with 2 men at work. The gravel is washed, with tunnel water, through six 14″ boxes furnished with Hungarian riffles. Shaw Bros., of Alta, owners.

*Shivley* (*Big Gun*) *Mine* (Hydraulic).—It is at Michigan Bluff. There are still a few remnants of the once great channel on the point below Michigan Bluff which are to be hydraulicked, permission having been granted by the Debris Commission. The owners have been engaged for some time in cleaning out old bedrock tunnels and flumes, and making other necessary preparations. The debris will be discharged into Dutch Gulch. Six men are at work. Powell Bros., of Michigan Bluff, owners.

*Small Hope Mine* (Drift).—See our XIIth Report, p. 212. It is 3½ miles N. of Forest Hill, and is worked in a small way by the owners. W. D. Craneage et al., of Forest Hill, owners.

*Southern Cross Mine* (Quartz).—See our XIIth Report, p. 212. It is near the North Fork of the American River, 4 miles N.W. of Damascus. The vein strikes N. 12° W., and dips 60° E. Idle. E. Ford, of Towles, owner.

*Southern Cross and Polar Star Mine* (Drift and Placer).—It is in Dutc Flat, at 3,100′ elevation, and comprises 140 acres. This was formerly hydraulic mine. At present the company is drifting at different point on the Polar Star under the gravel bank, which is 160′ high. Th tunnel is 300′ long, and the gravel carries 80% of bowlders, which ar largely left underground. The breasts are carried 7′ high, 40′ wide, an timbered with post and cap. Seven men are employed. J. Spaulding of Auburn, owner; W. T. Garrett, of Dutch Flat, superintendent.

*Spanish Mine* (Quartz).—It is 3½ miles W. of Auburn, at 1,050′ ele vation. There is a shaft and a tunnel on the mine, both caved an inaccessible; the former is said to be 200′ deep. A new cross-cut tunne is now being driven to the vein by 2 men. C. A. Reed, of Ophir, owner.

*St. George Mine* (Drift).—It is ¼ mile S. of Yankee Jim's, at 2,700 elevation. It is worked by two lessees. Charles Mason, of San Francisco owner.

*St. Lawrence Mine* (Quartz).—See our VIIIth and XIIth Reports, pp 461 and 212. It is 3½ miles W. of Auburn, at 1,000′ elevation. Th vein has a general strike of N. 70° W., and dips 30° to 45° S.W. The veir ranges from 6″ to 3½′ in width. There are two tunnels on the vein, th upper one being 650′ and the lower one 350′ in length. A shaft connect the upper tunnel with the surface. A 3′ Huntington mill on the property is also used for custom work. Four men are working. C. A. Reed, o Ophir, owner.

*Texas Mine* (Quartz).—It is 4 miles S. from Emigrant Gap, at 5,600′ elevation, and comprises 3,000′ on the vein. The vein courses N. and S., and dips 60° E., in slate, averaging 3′ in width. A tunnel cross-cuts 200′ to the vein and continues for 100′ on the same, giving 100′ of backs. The quartz is well mineralized, carrying iron sulphurets. There is also a shaft 110′ deep on the vein. Idle. Halsey Estate, of Towles, owner.

*Three Stars Mine* (Quartz).—See Columbia Gold and Silver Mining Co.

*Truro Mine* (Drift).—It is on Ford's Bar, on the American River, at 1,000′ elevation. A bedrock tunnel, at present 350′ long, is being driven to strike a former channel. An incorporated company, owner; S. C. Jordan, of Gold Run, superintendent.

*Washington Mine* (Drift).—It is at Deadwood. The mine is being cleaned out, after a long idleness, and the tunnel is to be extended, under contract, to the channel, which it is thought will be reached in 800′ more. Two men are at work. — Whitney et al., of Nevada City, owners.

*Watt Mine* (Drift).—It is 2 miles E. of Iowa Hill, and is worked by 4 men. Watt Bros., of Iowa Hill, owners.

*Weske Mine* (Drift).—See our Xth and XIIth Reports, pp. 441 and 213. It is 1½ miles N.E. of Michigan Bluff, and includes the *Manhattan*, which is a separate channel. The mine was formerly worked extensively and was completely equipped, having a locomotive for hauling trains of cars in and out of the mine, etc. The surface plant is rapidly falling into decay. The mine is now worked by lessees, who are operating on both the Manhattan and Weske channels. The latter is known in the Paragon and Mayflower mines as the *Orono* channel. Eight men are at work. James Muir, of Michigan Bluff, owner.

*Wild Yankee* (*Blue Bluff*) *Mine* (Drift).—It is 3½ miles E. of Shady Run, at 3,800′ elevation. This property has been converted from a hydraulic, but the owners have been placering a bank of quartz gravel 50′ high with water taken from the Cedar Creek ditch. The tail-flume dumps into Shady Run Cañon. Idle. C. Oak et al., of Towles, owners.

Tailings Works of the Alturas Mine.

MILLS IN PLACER COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | |
|---|---|---|---|---|---|---|
| | | | | | No. | Character. |
| American Bar | Water | 10 | 850 | | | |
| Big Dipper | S. & W. | 10 | 950 | | | |
| Black Oak | Steam | 5 | 850 | 10 | | |
| Bowlder | Water | 8 | 750 | | 1 | Johnston. |
| Breece & Wheeler | Steam | 10 | 800 | | | |
| Buttes | | 5 | | | | |
| Dahlonega | Steam | 8 | 850 | | | |
| Dardanelles | S. & W. | 5 | | 40 | | |
| Dorrer | | 10 | 850 | | | |
| Eclipse | Water | 10 | 850 | | | |
| Gold Blossom (1) | | 10 | | | | |
| Gold Blossom (2) | Water | 10 | 950 | | | |
| Golden Shaft | Water | 8 | 950 | 56 | | |
| Gold Ring | Water | 10 | 850 | 40 | | |
| Gray Eagle | Steam | 10 | | | | |
| Hathaway | Water | 20 | | | 4 | Johnston. |
| Herman | Steam | 10 | 1,000 | | 4 | U. I. Works. |
| Kidd & Johnson | Water | 5 | 650 | | | |
| Lady Bedford | | 2 | | | | |
| Malmsberg | | 5 | | | | |
| Mayflower | Water | 20 | | 160 | | |
| Morning Star | S. & W. | 10 | | | | |
| New Mill | | 5 | | | | |
| Pioneer | Water | 20 | 825 | | 8 | Frue. |
| Red Rock | Water | 10 | | | 2 | Union. |
| Shipley | | 10 | | | | |
| St. Patrick | Water | 15 | 750 | 22 | | |

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN PLACER COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | |
|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character |
| Bells | Water | | Kendall | | | | |
| Drummond | | 2 | Huntington | | | | |
| Jamison | Water | | Arrastra | | | | |
| St. Lawrence | | 1 | Huntington | 3′ | | 1 | Johnston. |
| Three Stars | Water | | Huntington | | | | |

## Plumas County.

*Alameda Mine* (Quartz).—See Florence Consolidated.

*Altoona Mine* (Quartz).—See our Xth and XIIth Reports, pp. 472 and 213. It is situated in Sec. 23, T. 36 N., R. 9 E., on the divide between Round and Indian valleys, 1½ miles S.W. from Crescent Mills, at 5,000′ elevation. The location is 1,500′ by 600′, and the vein courses N. 65° W., with a granitic foot-wall. Since our last Report very little work has been done, and the mine is now idle. Judge Emmons, of Greenville, owner.

*Alturas Mine* (Placer).—See our XIth and XIIth Reports, pp. 332 and 213. It is on Slate Creek, 3 miles S.E. of La Porte, and consists of 5½ miles on the bed of Slate Creek, with an average depth of 20′ of tailings. Bedrock cuts are run to straighten the channel and gain grade,

and the spring freshets are utilized for concentrating the material, whic is washed through flumes set on a 6″ grade and supplied with Hung rian riffles. Twenty-five men are employed. — Packer and C. Hende of La Porte, owners.

*Arcadian Mine* (Quartz).—See Round Valley M. Co.

*Bear Mine* (Quartz).—See our XIIth Report, p. 213. This propert is 14 miles S. of Prattville. Idle. F. C. Mandeville, of Butte Valle superintendent.

*Bell Mine* (Quartz).—See Dubuque.

*Beckwith Consolidated Mine* (Quartz).—See our XIIth Report, p. 21 Idle. E. McNeil et al., of Beckwith, owners.

*Blackhawk Mine* (Quartz).—See Bushman & Orr.

*Blackhawk Mine* (Placer).—See Musick & Schaefer.

*Black Oak Mine* (Quartz).—It is 6 miles W. from Quincy, at 3,40 elevation. Two claims have been located on a vein which courses N.W and S.E., and are designated as the *Black Oak* and the *White Oa* claims. There are two tunnels; the main one, 400′ in length, has bee extended during the last year, and a new one started near the nort end. An arrastra has been placed near the north end of the claim, an is run by a 20″ Gould water-wheel, requiring 17 miner's inches of wate under 70′ pressure, which is taken from a neighboring ravine. Two me are at work. H. P. Wormley, of Quincy, owner.

*Blind Lode Mine* (Quartz).—See our Xth and XIIth Reports, pp. 47 and 213. It is on Wolf Creek, 6 miles S.W. from Greenville. Idle D. McIntyre, of Greenville, owner.

*Blue Point Mine* (Quartz).—See Butterfly.

*Brant Point* (*Keystone*) *Mine* (Quartz).—It is 12 miles N.W. o Quincy, at 5,600′ elevation, and consists of a 1,500′ by 600′ location. Th 4′ vein trends N.W. and S.E., and dips N.E., between greenstone walls This is an abandoned mine, which is being rehabilitated. The old tunnel, 400′ long, with an incline at the end, has been cleaned out, and the incline is being sunk deeper. Three men are at work. G. Brant, o Quincy, owner.

*Brooks Mine* (Quartz).—See Duncan.

*Brown Bear Mine* (Quartz).—See Mountain King.

*Bushman & Orr* (*Blackhawk*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 328 and 214. It is in Blackhawk Ravine, at the mouth of Eliza's Fork, at 3,350′ elevation. Idle. Musick & Schaefer, o Quincy, owners.

*Butte Mine* (Quartz).—See Mountain King.

*Butterfly Mine* (Quartz).—See our XIIth Report, p. 214. It is 6 miles N.W. of Quincy, at 3,375′ elevation. The property comprises four locations and a fraction with two parallel veins, known as the *Governor* and *Blue Point*, which start with an east dip and then reverse. The Governor vein is 7′ wide and carries 5% of sulphurets; the Blue Point is 9 to 16′ wide; both are encased in slate. On the Blue Point is a cross-cut tunnel 70′ to the vein, and 60′ above on the surface is a shaft 50′ deep. On the Governor is a 50′ shaft, with a 70′ drift (to the north) from the bottom, showing a 7′ vein in the face; also, a 56′ cross-cut tunnel to the vein 200′ lower, with 30′ turned on the vein, which is 5′ wide. There is a 10-stamp steam-power mill, with 80 H.P. boiler, 800-lb. stamps, old-style Frue vanners, and a Gold King amalgamator. Sixty miner's inches of water, under 200′ pressure, may be had by building a 2-mile

ditch from Butterfly Creek. Eighteen men are generally employed. Thompson & Kellogg, of Spanish Ranch, and A. Smith, of Quincy, owners.

*Byers Mine* (Quartz).—See Halsted.

*Cahalan Mine* (Quartz).—It is situated about 1½ miles N.W. of Crescent Mills, at 3,900′ elevation, and consists of a patented claim, 500′ by 300′. The vein is over 12′ wide and low-grade; trends N.W. and S.E., and dips nearly vertically. It is well adapted for economical working, being convenient to water-power, well supplied with fine mining timber, and may be opened by tunnels on the vein to a depth of six or seven hundred feet. Three tunnels have been driven; the longest is over 500′ on the vein. Idle. Dr. Carter, of Crescent Mills, owner.

*California* (*A. C. Light's*) *Mines Nos. 1, 2, 3, and 4* (Quartz).—These are 1½ miles S.W. of Taylorsville, at 4,600′ elevation. Two of the claims are located on a "pocket" vein, 2″ to 6″ in granite, which trends N.W. The other two claims are on a very heavy outcrop of low-grade quartz, showing very few sulphurets, and trending E. and W. and dipping N. While a number of tunnels have been driven on the seam locations, but little development has been done on the larger outcrop. One man is at work. A. C. Light, of Taylorsville, owner.

*California Gold Mining and Investment Co.'s* (*Taylor Diggings*) *Mine* (Hydraulic).—This property is situated in Genesee Valley, 3 miles N.W. from Genesee, at 5,500′ elevation, and comprises 200 acres along an ancient channel with from 4′ to 60′ of gravel, carrying fine gold throughout. It is being put in condition, so as to commence washing the coming season. Water will be obtained from Taylor Lake, and from near the head of Davis Creek, through a ditch in course of construction, which will be 12 miles long and 3′ wide on bottom and 3′ deep; 6 miles have been completed. Two giants are to be used, under 150′ pressure. No derrick will be required. Eleven men are at work. An incorporated company, of Chicago, Ill., owner; J. F. Clapp, of Genesee, superintendent.

*Calliope Mine* (Placer).—It is 4 miles E. of Butte Valley, on a bar of the North Fork of Feather River, at 3,425′ elevation. The claim contains 20 acres. The pit is about 60′ wide, with a 10′ bank of gravel, which contains over 50% of large bowlders and cobbles; coarse gold, partially black, is scattered throughout. A derrick with 40′ boom, run by a 9′ overshot wheel, hoisting 50 tubs of gravel per shift, is used. A Chinese pump, 18″x 30′, is run by an 8½′ overshot wheel, with 4½′ breast. The gravel is washed through 20 boxes, 14″ wide, set on a grade of 1′ to the box, and furnished with pole riffles. The season lasts five months. Seven men are employed. H. L. White & Son, of Butte Valley, owners.

*Cameron Mine* (Drift).—It is 3 miles S.E. from Butte Valley, on the North Fork of Feather River, at 3,400′ elevation, and contains 80 acres on an ancient channel following a northeast course under what is known as the Big Flat. A 780′ bedrock tunnel, of which 560′ is in rim rock, reaches a point 30′ below the channel and is connected with it through an upraise. The gravel and lava capping is 600′ deep, and the gravel in the channel is breasted out 6′ high and 40′ wide and timbered with post and cap; it carries about 60% of bowlders and cobbles, with coarse gold. A breaster can take down three carloads of 1,500 lbs. each, per shift, which yield from $2 to $4 per carload. Eighty feet of the channel upstream has been worked. The gravel is washed with

the mine water through 4 boxes, 12″ wide, with 14″ grade per 16′, ar furnished with Hungarian riffles. Three men are employed. Ang Cameron, of Butte Valley, owner.

*Cascade Mine* (Hydraulic).—It is 10 miles S. from Genesee, 5,900′ elevation, and contains 160 acres. The bank is 120′ high, an all gravel; the pit is 250′ across the face and carries fine gold throug out; it is said that, as the work has progressed up the channel, the valu per cubic yard has gradually increased from 13 cents to 20 cents. hand-derrick, with 90′ mast and 50′ boom, is used. Water is obtaine from Clear Creek through ditches 3½′ wide; the north ditch has a grade 2½″ per rod and the south ditch 1½″ per rod, the combined capacit being 800 miner's inches. The water season is about ninety days, but reservoir under construction at Lovejoy's ranch will extend it to eig months. Two No. 3 giants, with 4″ and 4½″ nozzles under 250′ pressur are used, the water being conducted through 2,000′ of 11″ pipe. Eig men are employed. T. R. Walsh, of Vallejo, Solano County, owner.

*Cayot Mine* (Quartz).—See our XIIth Report, p. 214. It is on Fa River, 9 miles W. of La Porte, at 4,600′ elevation, and consists of fiv claims. Since our last Report a 215′ drift has been run northeast fro the upper (30′) cross-cut tunnel, which shows a continuous pay-sho for 200′, with a 7′ vein in the breast, and 120′ of backs. It course N.E. and dips 70° N.W., and carries a fair percentage of sulphurets good grade. One man is at work. F. Cayot, of La Porte, owner.

*Centennial Mine* (Drift).—See our XIIth Report, p. 214. It is on th North Fork of Feather River, 10 miles S. of Prattville, in T. 26 N R. 8 E. J. S. Bransford et al., of Quincy, owners.

*Centennial Mine* (Drift).—See our XIth and XIIth Reports, pp. 32 and 214. This mine is 4 miles N.W. from Quincy, and shows but littl development. — Challen et al., of Spanish Ranch, owners.

*Centennial* (*Brandt*) *Mine* (Quartz).—See our XIIth Report, p. 21 It is situated on Ward Creek, on the south side of Genesee Valley, 1 miles S.E. from Taylorsville, at 4,200′ elevation. Deane & Fletcher, o Reno, Nev., and — Moore, of Woodland, Yolo County, owners.

*Chico Star Mine* (Quartz).—It is 6 miles from Butte Valley, at 3,300 elevation, and contains two claims. The 12″ vein trends N.W. and S.E. and dips 45° S.W., between slate and greenstone. The quartz carrie a large percentage of high-grade sulphurets, in part arsenical. There is a cross-cut tunnel to the vein. Dunn Bros., of Butte Valley, owners

*Chip Creek Mine* (Drift).—It is 20 miles N.W. from Spanish Ranch and contains 20 acres. There is a 60′ tunnel on the bedrock, in a 12 gravel bank, from which the breasts are carried 20′ wide and 6′ high. The percentage of bowlders is large, requiring a portion to be run out The gold is coarse. Wash-water is taken from the neighboring ravines, through 1 mile of ditch. The gravel is washed through 60′ of 12″ flume supplied with Hungarian riffles. Two men are at work. Geyrand & Son, of Spanish Ranch, owners.

*Cleveland Mine* (Quartz).—It is 1 mile S.W. from Greenville, at 3,200 elevation. The vein trends N.E. and S.W., and dips 60° S.E., between a serpentine foot-wall and a granitic hanging-wall. Two cross-cuts, a different levels, 100′ long, cut through the hanging-wall to the vein; from the upper one a 125′ drift to the southwest showed a 1′ vein with broken walls, and a 50′ drift to the northeast showed a 2′ vein. In the lower tunnel a heavy flow of water was tapped. There are two 10′ arrastra

driven by 12′ horizontal wheels, with water taken out of North Cañon. Five men are employed. G. B. Cazzaglio and G. B. San Felipe, of Greenville, owners.

*Concordia Mine* (Hydraulic).—See Tefft & Co.'s Mine.

*Consignee Mine* (Drift).—See our XIth Report, p. 330. It is situated on the Middle Fork of the Feather River, about 20 miles S.E. from Quincy, at about 4,700′ elevation. A long bedrock tunnel has been run and upraises made without realizing satisfactory returns. Idle. An incorporated company, owner.

*Coquette Mine* (Quartz).—It is 8 miles S. from Buck, at an approximate elevation of 4,700′. It contains four locations, on different veins, three trending N.E. and S.W., and dipping about 70° S.E. They are in granitic formation, and range from 18″ to 8′ in width. A 400′ tunnel cross-cuts these veins, and on each are drifts. Considerable stoping has been done. A lower cross-cut has been started, and has attained a length of 100′. The fourth vein, designated as *El Capitan*, is about 2′ wide, trends more N. and S., and lies S.E. from the others in the slate; on it is a 60′ shaft and a 100′ tunnel. The ore is reduced in a 10-stamp water-power mill, with 750-lb. stamps. The water is obtained from Little Coquette Creek, and applied on a 6′ Knight wheel under 110′ pressure. Three men are employed. J. J. Lawrence and — Snell, of Merrimac, Butte County, owners.

*County Line Mine* (Quartz).—It is situated on Dean's Hill, 4 miles N.E. from Merrimac, Butte County, at about 4,700′ elevation. The 2′ vein trends N.E., and dips S.E. between slate and porphyry. A 40′ shaft has been sunk on the vein, and two tunnels driven, each about 100′ in length. Two men are at work. W. B. Harbin, of Merrimac, Butte County, owner.

*Crescent Mill and Mining Co.'s Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 481, 469, 330, and 214. The mine is situated in Sec. 24, T. 26 N., R. 9 E., near Crescent, Indian Valley, at about 3,700′ elevation, and the 1,500′ by 800′ location embraces the *Crescent Pet*, *Horseshoe*, *Lee*, and *Ophir* veins. Worked to a depth of 400′, and the ore too low-grade to pay. Part of the mill is run on custom rock, and also on that from the old waste-dumps. A. W. Whitney, of Crescent, superintendent.

*Crescent Pet* (Quartz).—See Crescent Mill and Mining Co.

*Cub Mine* (Quartz).—See our XIIth Report, p. 214. It is situated in T. 23 N., R. 8 E., 14 miles from Prattville. Idle. Cub Mining Co., of Butte Valley, owner; F. C. Mandeville, superintendent.

*Diadem* (*Edman*) *Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 486, 323, and 214. It is situated on Mulmford Hill, 2 miles S.W. from Meadow Valley, at about 5,000′ elevation. Since our last Report little or no development has been done; part of the mine has been retimbered. — Edman et al., of Meadow Valley, owners.

*Ding Dong* (*Rattlesnake*) *Mine* (Drift).—It is on Gamblers' Ravine, 4 miles N. of Quincy, at 3,450′ elevation, and comprises 100 acres. This claim is on what is known as the Western channel; it has been proven to be 60′ wide, and carries coarse gold. The gravel, from 1′ to 6′ deep, is easy picking, and contains heavy bowlders. Above the gravel is 6′ of pipe-clay and 75′ of lava. At the end of the 280′ bedrock tunnel is a 16′ upraise into gravel, and thence a 70′ drift along the rim. Higher up is a second tunnel, 130′ long. An air-shaft 96′ deep has been sunk

to the gravel on the back rim. The gravel breasts are worked 5′ hig and 10′ wide, timbered with full sets. A quartz ledge, 2½′ wide, run across the slate bedrock and has been sunk on about 10′, showing a $ per ton prospect in the horn-spoon. Water for washing is obtained from Little Blackhawk, as well as from the Quincy Water Co.'s ditch. Two men are employed. J. Lowrey et al., of Quincy, owners.

*Drury and Pacific Mine* (Quartz).—See McGill and Standard.

*Dubuque* (*Bell*) *Mine* (Quartz).—See our Xth Report, p. 478. Idl

*Dude Mine* (Quartz).—See Duncan's.

*Duncan's Mines* (Quartz).—They are situated on the N. side of th east branch of the North Fork of Feather River, at the mouth of Rus Creek, at 2,650′ to 3,100′ elevation, and consist of the *Ohio Poin* (1,340′ by 600′), the *Dude* (931′ by 600′), and the *Brooks* (1,371′ by 600′ Their course is N. 43° W., and dip 55° S.W. The first two are contigu ous to the river and are twice cut by it to a depth of 22′, exposing a outcropping body of quartz about 700′ long and 78′ wide. Few develop ments have been made. The property includes a mill site and a 3-mil ditch with a capacity of 1,200 miner's inches, diverted from Rus Creek, giving 420′ pressure at the mill site. W. C. Duncan, of Orovill Butte County, owner.

*Dutch Hill* (*North Fork Hydraulic Mining Co.'s*) *Mine* (Drift).—Se our VIIIth and XIIth Reports, pp. 482 and 215. It is 7 miles S.E. fro Prattville, at approximately 4,500′ elevation. Since our last Report th Logan tunnel has been extended to 1,100′, of which 300′ were run th past year. From 4 to 6 men are employed. Savercool Bros., of Butt Valley, and F. Miller, of Sacramento, owners.

*Edman Mine* (Quartz).—See Diadem.

*Elizabethtown Gravel Channel Mining Co.'s* (*Riverdale*) *Mine* (Drift) See our Xth and XIIth Reports, pp. 478 and 215. It is ½ mile N.E. o Quincy, at 3,325′ elevation. Since our last Report the property has bee bonded to parties from San José, who are sinking a double-compartmen shaft, which is 35′ deep. Eight men are employed. W. W. Kellogg, o Quincy, owner.

*Ella Mine* (Quartz).—It is 6 miles N.E. from Merrimac, Butte County at 4,800′ elevation. The vein is about 20″ wide, courses N.E., and dip nearly vertically (slightly south) in granite. Several tunnels hav been driven to the ledge, the longest of which is 320′, giving 90′ of backs Stringers of gold-bearing quartz extend for a distance of 3′ to 4′ into th foot-wall. The quartz carries 1½% of high-grade galena, arsenical and iron sulphurets. Four men are employed. J. A. Hall, of Merrimac Butte County, owner.

*Emerson & McMullin Mine* (Drift and Placer).—It is on Grizzly Creek 6 miles S. from Genesee, at 5,150′ elevation, and comprises 80 acres on a break from a former bench of Grizzly Creek. The open cut is 40′x 18′ Two derricks are used: one a small hand-power, and the other a water power, with 50′ mast and 40′ boom, operated by a 7′ wheel with 3′ breast The 200 miner's inches of water are diverted from Grizzly Creek through a ditch ¼ mile long, and can be delivered under 150′ pressure if required. The gravel, which contains numerous large bowlders, with coarse-washed gold on the bedrock, is washed through 700′ of 12″ flume, set on a grade of 5½″ to 12′, furnished with pole riffles, the upper boxes of which are cleaned up every two weeks during the eight months' water season. Three men are employed. A. Joseph, of Genesee, owner.

*Emigrant Hill Mine* (Hydraulic).—See Plumas-Imperial.

*Emigrant Mine* (Drift).—See our XIIth Report, p. 215. It is 2½ miles S. of Quincy, at 3,375′ elevation, and comprises 80 acres. R. Bell, of Quincy, owner.

*Fall River Consolidated Mine* (Quartz).—See our XIIth Report, p. 216. It is on Fall River, 9 miles W. from La Porte, at 4,500′ elevation, and consists of two locations. Since our last Report a third ore-shoot has been cut near the surface south of the main workings, and the drifts in the main workings have been extended on the course of the vein; the main cross-cut is also being driven to reach the third vein, about 80′ ahead. The 5-stamp water-power mill runs intermittently. Two men are employed. J. C. Wolters et al., of Gibsonville, owners.

*Florence Consolidated Mine* (Quartz).—It is near the junction of Coquette and Cold Water creeks, 3½ miles E. of Merrimac, Butte County, at an elevation of 4,700′. It comprises three claims: the *Alameda*, *Lily*, and *Florence*, which course N.E. and dip S.E., between porphyry and slate walls. The vein is from 4′ to 6′ in width, and carries a small percentage of sulphurets and free gold. The developments consist of a 30′ shaft on the vein and a tunnel intended to cut the vein about 50′ below the surface; another tunnel run on the vein in the Alameda shows a 5′ vein in the breast. The mill site is situated in the forks of the two creeks, which furnish permanent water-power. Excellent timber is at hand. Two men are at work. E. C. Robinson, of Merrimac, Butte County, owner.

*Four Hills Mine* (Quartz).—It is 6 miles in a S.W. direction from Johnsville, at 7,150′ elevation, on the border between Plumas and Sierra Counties. It comprises seven locations on a vein, from 2′ to 20′ wide, which trends N.W. and S.E., and dips from 40° to 70° S.W., between metamorphic slate and syenite. The quartz, though low-grade, has produced some phenomenally rich shoots, which have been followed in the development of the mine, leaving large reserves of low-grade ores available. After a period of idleness the mine has been reopened, new buildings erected, and a lower tunnel started, at 6,925′ elevation. The new lower tunnel to date of writing had acquired a length of 40′, in which it gained a foot in depth for every foot ahead. The former main tunnel, known as the Mexican, is 150′ in length and cross-cuts the lode, in which are two drifts, about 1,000′ to the S.E. and about 300′ to the N.W. There is an old, dilapidated 10-stamp mill on the ground. Twelve men are employed. Four Hills Mining Co., of San Francisco, owner; Ogden Hoffman, of Johnsville, Plumas County, superintendent.

*Franklin Mine* (Drift).—See Gladiator.

*Franklin Consolidated Mine* (Drift).—See our XIIth Report, p. 216. It is 5 miles W. of Poker Flat, and contains 480 acres. D. McFarlane et al., of Beckwith, owners.

*Frazier Mine* (Quartz).—It is 6 miles N.E. of Merrimac, Butte County, at 4,775′ elevation. The location contains three parallel veins up to 2½′ in width, with a N. of E. course, and nearly vertical dip, in granite country rock. The ore carries a large percentage of high-grade sulphurets, which are saved and shipped. The developments consist of a 500′ cross-cut tunnel 200′ to the first, thence 240′ to the second, and thence 60′ to the third, vein. The first two veins have been drifted upon about 100′ S., while the third has been drifted on 30′ N. and 70′ S. An air-shaft connects with the cross-cut. At the mouth of the cross-

cut is a 6′ Huntington roller mill and Triumph cencentrator, driven b a steam-engine with 8″x 14″ cylinder, consuming 1¼ cords of wood pe day. Fourteen men are employed. An incorporated company, c San Francisco, owners; T. W. Finchley, of Merrimac, Butte County manager.

*Gallagher Mines* (Quartz).—They are 4 miles N. of Johnsville, on th head of Bear Creek, at 6,250′ elevation, and comprise six claims on thre parallel veins. The veins, with a width of 2′ in the present develop ments, trend N. and S., and dip slightly to the east. The formation i metamorphic slate and syenite. There are several tunnels of consider able extent, closed by caving at the mouth; the present working tunne cuts the veins at a depth of 132′. There is an 8-stamp water-powe mill, with 650-lb. stamps, half of which are running on one shift crushing 4 tons daily. The power is developed by a 4½′ Pelton wheel from water derived from the Indian ditch, which heads in Bear and Squirrel creeks, using mostly snow-water. Two men do all the work Gallagher Bros., of Johnsville, owners.

*Garfield Flat Mine* (Hydraulic).—It lies 4 miles in a N.E. direction from Johnsville, at 5,500′ elevation, and contains 180 acres. The gravel bank averages only 10′ in height, and the pit is about 300′ wide. No derricks are required. The water is brought from Bear Creek through a ditch ½ mile long, 2′ on the bottom and 3′ deep, ending in two reservoirs; one No. 3 giant with 3″ and 5″ nozzles, under 100′ pressure, can pipe for three hours per day, the reservoirs emptying in three quarters of an hour. The pipe-line is 800′ in length, reducing from 18″ to 11″. The flume is 1,100′ long, 2′ wide, set on a 4½″ and 6″ grade, and paved with 6″ blocks. The dump is in a dry ravine, emptying into Squirrel Creek along which are four restraining dams. The first is 16′ high, built of logs and brush; the second is 8′ high, also of logs and brush; the third 7′, and the fourth 12′. There is ½ mile distance between the first two dams. Three men are employed. P. Lorenzi, of Johnsville, owner.

*General Harrison Mine* (Drift).—See our XIIth Report, p. 216. It is situated 9½ miles N.E. of Gibsonville, at 5,400′ elevation. C. H. Radcovich, of Johnsville, owner.

*Genesee Valley (Ward) Mine* (Quartz).—See our Xth Report, p. 476 It is situated on Ward Creek, about 3 miles S. from Genesee, at 4,100′ elevation, and consists of a quartz location and 20 acres of placer ground. The vein trends N.W. and S.E., with a somewhat varying dip, averaging 50° S.W., inclosed in a much-folded slate rock. The present principal workings are carried on through a double-compartment 4′x 8′ shaft back of the mill and at a sufficient height above it to permit of the ore being at once run to the mill. Near the bottom, drifts extend 300′ S. and 150′ N., along the vein. An 8″ jackhead pump, running twelve hours per day, keeps the works dry. The vein makes in swells, attaining a width of 5′, and carries a large percentage of black oxide of manganese that is frequently intimately mixed with fine free gold. In the lower works, and underneath the vein, quartz has been cut carrying gold and a large percentage of sulphide and carbonates of copper. Southeast of the shaft is a tunnel, driven on the vein, from which a 65′ incline has been sunk, disclosing a 5′ body of quartz, on which considerable stoping has been done. North of the shaft is another tunnel run on the vein, from which, in former years, a large amount of a fair grade of ore was taken. There is a 10-stamp mill, also an arrastra and two vanners; the power being

developed from a 25′ overshot and a small Pelton wheel (for the concentrators). The stamps weigh 650 lbs., drop 6″ 85 times per minute, and crush 12 tons per day through a No. 10 screen. The hoist is driven by a 17″ Leffel turbine. A home-made dynamo for 200 incandescent lights supplies a few lights to the buildings. Water is diverted from Ward Creek through a flume. Ten men are employed. J. Gruss et al., of Genesee, owners; J. Gruss, manager.

*Gladiator* (*Sunnyside, Franklin, etc.*) *Mines* (Drift).—They lie at the S. end of McRae Ridge, 9 miles W. of Johnsville, at 6,425′ and 7,290′ elevation, and consist of a group formerly known as the *Sunnyside*, 160 acres; *Franklin*, 180 acres. They are being prospected under a bond, and on the Sunnyside various openings and drifts have been made on the course of the channel. On the Franklin claim there is a 360′ tunnel; on the *Beckwith* there is a 200′ tunnel that cuts a ledge. On the side of the ridge, on the Sunnyside, a good deal of hydraulicking has been done, resulting in obtaining considerable nugget gold, some pieces weighing several thousand dollars. A good many of the bowlders indicate glacial action. Aside from the direct mining operations, borings have been made to locate the lay of the channel. The Sunnyside tunnel has been driven 830′, through lava and clay. Near the breast a shaft was sunk 105′ and a drift extended 90′ N. The latter part of the drift is on the incline, and cuts through 4′ of gravel next the bedrock, the latter pitching to the N.W. The general course of the channel appears to be S.W. A good deal of the ground could be worked to advantage by hydraulicking, if the facilities for impounding the debris were favorable. For three months in the year snow-water is available through a ditch, 1¾ miles long, 2′ wide and deep, with ¾″ to the rod grade. Twelve men are employed. William Doolittle, of Dutch Flat, Placer County, superintendent.

*Glazier Mine* (Drift).—See our Xth Report, p. 495. It is on the North Fork of Feather River, 4 miles S.E. from Butte Valley, at 3,525′ elevation, and comprises 165 acres on the Dutch Hill channel. A tunnel at the lower end of the claim and about 1 mile from the old workings has been driven 1,000′ through slate bedrock, and some little drifting has been done. It will be continued until the "back rim" is passed. It is 300′ below the surface of Big Flat and 40′ beneath the channel, with which it is connected by several upraises. A 65′ air-shaft connects with the tunnel 100′ from the mouth. The mine water, filling a reservoir 12′x16′x6′ every two hours, is used in washing the gravel. No breasting has been done. Six men are employed, working two shifts. Dr. J. P. Welch, of Butte Valley, owner.

*Golden Reef Mine* (Drift).—See our XIIth Report, p. 216. It is on Spanish Creek, 2 miles W. of Quincy, at 3,200′ elevation. Since our last Report the drift has been continued up channel, and a shaft sunk. Agassiz & Shaw Co., of Boston, Mass., owners.

*Golden Stair Mine* (Hydraulic).—It is a new enterprise on Clear Creek, situated 10 miles S. from Genesee, at 6,683′ elevation, and comprises 160 acres on what is supposed to be the "Old Blue Lead" channel. A 100′ shaft has been sunk 22′ through barren gravel and 80′ through gray lava. The company has built 3 miles of road. Three men are at work. R. W. White, John Sparks, et al., of Genesee, owners.

*Gold Log Mine* (Drift).—It is situated on Grizzly Creek, 6 miles S. of Genesee, at 5,775′ elevation, and comprises 100 acres. Four bedrock

tunnels have been driven, mostly too high, though all show river-wash of large bowlders, but without gold. The ground appears to be a portion of a slide from the main channel. The present tunnel is 500′ in length. Next to the creek, just beyond this point, nugget gold has been found. Two men are at work. W. H. Adams and C. Morain, of Genesee, owners.

*Gold Mountain Consolidated Mine* (Drift).—See our XIth Report, p. 332. It is situated ½ mile N.E. of La Porte, at 5,000′ elevation, and comprises five claims. Idle. An incorporated company, of Streator, Ill., owner.

*Good Hope* (*Richmond Hill*, *Sawpit Flat*), *Mines* (Hydraulic and Drift).—They are 6 miles N. of Gibsonville, Sierra County, at an elevation of about 6,000′, and contain 2,400 acres. These old mines were extremely rich in former days, and are being prepared to work again by the hydraulic method. Dams are in course of construction. The gravel bank at Sawpit Flat is about 100′ high. To reopen the Richmond Hill channel a tunnel will be necessary. Between 2,000 and 3,000 miner's inches of water, taken from a reservoir at Onion Valley through about 10 miles of ditch, and delivered under 300′ pressure, are available. Two monitors, with 5″ nozzles, and 450′ of 4′ bedrock flume, are to be used. Twenty-five men are at work—ten on the dam and fifteen on the ditches and pipe-lines. An incorporated company, owner; A. H. Schnabel, of Gibsonville, superintendent.

*Governor Mine* (Quartz).—See Butterfly Mine.

*Granite Basin Beauty Mine* (Quartz).—See Homestake.

*Grant & Davis Mine* (Quartz).—It is at the head of Kellogg Ravine, 14 miles N.W. from Spanish Ranch, at 3,500′ elevation, and comprises two claims, forming the extension of the Shenandoah Mine. It is being opened up by a cross-cut, at present in 50′. Quite a distance will have to be driven before cutting the vein. The main vein, where uncovered, shows 2½′ of solid quartz, between slate walls, with numerous stringers making from the walls. Two men are at work. J. Grant and T. Davis, of Spanish Ranch, owners.

*Graves Mine* (Quartz).—It is 5 miles N.E. from Merrimac, Butte County, at 4,730′ elevation. The claim includes three claims from 18″ to 2′ in width, in granite, trending N.E. and S.W. It is developed by a 75′ and a 300′ tunnel on No. 1 vein, a 75′ and a 35′ tunnel on No. 2 and No. 3 veins, respectively. Three tons of ore are crushed daily in a 4-stamp mill with 275-lb. stamps, driven by a 6′ hurdy wheel under 45′ pressure, with water taken from Arrastra Creek, through ¼ mile of ditch. Two men are at work. W. C. Graves, of Merrimac, Butte County, owner.

*Green Ledge Mine* (Quartz).—It is on Ward Creek, about 4 miles S. from Genesee, at 4,100′ elevation. The vein carries carbonate and sulphides of copper, with gold, and trends N.E. The surface ore was formerly worked in an arrastra, and is said to have yielded as high as $60 per ton. J. Young and C. F. Brown, of Taylorsville, owners.

*Green Mountain Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 479, 471, and 217. It is situated ½ mile W. of Crescent Mills, at 3,850′ elevation, and is 4,500′ by 600′. During the past year No. 6 tunnel, over 1 mile long, has been cleaned out, retimbered, somewhat extended, and several cross-cuts made through the vein. Twenty-

five men were employed. Idle, pending sale under a bond. J. Goodwin et al., of Quincy, owners.

*Grizzly Bear Mine* (Hydraulic).—It is on Squirrel Creek, 4 miles N. of Johnsville, at 5,800′ elevation on the bedrock, and contains 160 acres. It is not a true wash gravel, but in the nature of a glacial drift. The bank is 25′ high and 200′ wide, with coarse gold throughout. Three hundred miner's inches of water are brought from Bear Creek, through 1½ miles of ditch, 4′ wide on the bottom, during three months in the year. Two giants, with 3″ and 4″ nozzles, under 250′ pressure, are used, and two pipe-lines, 400′ long, reducing from 18″ to 12″. The flume is 2′ wide, 1,000′ long, and paved with wooden blocks. Six men are employed. N. Rossi & Co., of Johnsville, owners.

*Halsted Mines* (Quartz).—See our XIth Report, p. 326. They are situated on the east branch of North Fork of Feather River, near the mouth of Rush Creek, at Twelve-Mile Bar, 9 miles N.W. of Spanish Ranch, at an elevation of 3,100′ to 4,000′, and consist of the *Byers*, *Joe Halsted*, and *Rich Gulch* claims, each 1,500′ by 600′. The average course of the ledge is N. 50° W., and dip 50° N.E., inclosed in slate, with large blowout 18′ to 20′ wide. It is developed through numerous tunnels. The whole mass is low-grade, carrying a small percentage of sulphurets, chiefly near the walls. A 4-stamp water-power mill is connected with the property. Idle. Joe and A. D. Halsted, of Spanish Ranch, owners.

*Happy Thought Mine* (Quartz).—See Homestake.

*Hibernia* (*Pennsylvania*) *Mine* (Quartz).—It is 2 miles S.E. from Greenville, at 4,325′ elevation, and contains two claims, 1,500′ by 600′ each, on a vein 5′ to 12′ wide, with a N.W. trend and vertical dip, between syenite walls. The four main working cross-cut tunnels have been reopened and retimbered by the new owners. A new 10-stamp mill has been built 1 mile below the mine. The 20 inches of water for power are derived from McClellan Ravine, and delivered under 300′ pressure. Fourteen men are employed. B. F. Gullic, C. J. Cloud, et al., of Greenville, owners; C. Robertson, of Greenville, superintendent.

*Holloway Mine* (Hydraulic).—It is on the forks of Hopkins Creek, 8 miles N.E. of Gibsonville, at an elevation of 5,000′. The claim is on the "Blue Lead," and carries a clean, cemented gravel on the slate bedrock. The pit is 250′x 400′ and 27′ high, and of this 150′x 300′ was worked last year. Seventy per cent of the gravel is bowlders. One giant, with 3″ and 4″ nozzles, under 150′ pressure, is used. Water is taken from the west branch of Hopkins Creek through a ditch between 2 and 3 miles long. The water season lasts three months. The tail-flume is 300′ long and 30″ wide. Six men are employed. Spencer & Gould, of Gibsonville, owners.

*Homestake* (*Swan*) *Mines* (Quartz).—They are 6 miles N.E. of Merrimac, Butte County, at 4,875′ elevation, and comprise the *Happy Thought*, *Granite Basin Beauty*, *Siebbert*, and *Homestake* locations, with a separate vein on each, all trending N.E. in the granite, with an average width of about 20″, and carrying 1% of high-grade sulphurets. There are two tunnels on the Homestake, 300′ and 400′ long, and stoped 70′ from the surface. On the Siebbert a shaft has been started. On the Happy Thought there is a 60′ tunnel on the vein, giving 20′ of backs. On the Granite Basin Beauty there is a 25′ shaft. A 5-stamp water-power mill, with 450-lb. stamps and 24′ overshot wheel, crushing 3 tons in twelve

hours, is on the property. Four men are employed. John Garner, o Chico, Butte County, owner.

*Horseshoe Mine* (Quartz).—See Crescent.

*Hungarian Hill Mine* (Hydraulic).—See Plumas-Imperial.

*Hungarian Hill Mining Co.'s Mine* (Hydraulic and Drift).—It is 3 miles S.W. of Quincy, at about 4,700′ elevation, and embraces 500 acres The ground was formerly worked as a hydraulic; later it was decided to drift the lower strata, and a tunnel was run 400′ through slate bedrock but did not reach the channel, probably because it changed its direction; so the claim is being refitted as a hydraulic. The water for the purpose is taken from Gansner Ravine and Slate Creek, through two ditches, whose capacities are 800 and 400 miner's inches, respectively, emptying into three reservoirs. The tailings will dump into Quigley Ravine, where a log and brush dam will give ample and safe storage. Four men are at work. J. H. Whitlock et al., of Quincy, owners.

*Indian Hill Mine* (Hydraulic).—It is 12½ miles S.W. from Spanish Ranch, at 2,450′ elevation, and comprises three claims. The gravel bank is 50′ high and 300′ wide, and is worked through a bedrock cut dumping on a bar on the east branch of the North Fork of Feather River. The percentage of bowlders and cobbles is very large, and the gold is quite coarse and mostly on the bedrock. One quarter of an acre has been washed this season with 100 miner's inches of water, delivered through 500′ of 11″ pipe to a giant with 3½″ nozzle, under 100′ pressure. A hand-power derrick, with 40′ mast and 35′ boom, is used to remove bowlders. The water is diverted from Kellogg Ravine, through 1 mile of ditch, and lasts from three and a half to four months. The tail-flume is 300′ long and 18″ wide, in which pole riffles are used, and is cleaned up once during the season. Three men are employed. Eyrand & Lasirer, of Spanish Ranch, owners.

*Indian Valley Mine* (Quartz).—See our Xth Report, p. 473. It is 1 mile S. from Greenville. Well opened. Furnished with 20-stamp water-mill, air-compressor, machine drills, etc. Idle, on account of differences with the water company.

*Jamison Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 480, 483, 330, and 217. It is 2 miles S. of Johnsville, at about 5,000′ elevation, and is temporarily idle. The water-right is one of the finest in the State, and consists of four natural lakes with a ditch of 1,000 miner's inches capacity, and 1¼ miles long, delivering the water under 500′ pressure. An incorporated company, owner; — Cheney, of Johnsville, superintendent.

*Joe Mine* (Quartz).—See Halsted.

*John Bull and Phœnix Mine* (Quartz).—See our XIIth Report, p. 217. It is situated 2½ miles in a S.E. direction from Greenville, at 3,600′ elevation. Since our last Report the Phœnix tunnel has been driven 540′ on the vein to intersect a heavy vein running S. 54½° W., which at the crossing of North Cañon shows 18′ wide, dipping E. In about 56′ the tunnel will reach the vein. The ore in the mine is extremely low-grade. Two men are at work. S. Firmstone and John Richards, of Greenville, owners.

*Kanaka Flat Mine* (Placer).—It is 6 miles W. of Spanish Ranch, at 3,200′ elevation, and comprises 60 acres of shallow gravel (from 1′ to 3′ deep), spread over a large flat; dumping facilities are poor. The gold contained in the gravel is fine. Water is diverted from Spanish Creek

and Kanaka Flat. Two men are at work. Jack & Wampler, of Spanish Ranch, owners.

*Keystone Mine* (Quartz).—See Brant Point.

*King's Gravel Mine* (Drift).—See our XIIth Report, p. 217. It is on the North Fork of Feather River, 12 miles from Prattville, at 3,450′ elevation. Since our last Report, 100′ of air gangway has been driven, and 450′ in length of the channel has been breasted 120′ wide, timbered with 4′ posts and caps. New buildings and roads have been built. The tailings of this mine are sold to a company of Italians for reworking, the company previously washing through three sets of flumes, with falls of over 10′ between. Undercurrents will be also used. Six men are at work. F. King et al., of Butte Valley, owners.

*King Solomon's Mine* (Quartz).—It is 9 miles N.E. of Taylorsville, at 6,500′ elevation, and comprises seven claims on two parallel veins 200′ apart, 12′ and 64′ wide, respectively, trending N.W., and dipping about 65° N.E., between slate and greenstone, carrying a good selvage on both sides. In the 5′x 8′ vertical shaft, at a depth of 60′, drifts have been run, 100′ to the N. and 50′ S. on the foot-wall side, which carries for 20′ wide a better grade of ore than the remainder of the vein. It is said the entire width of the vein mills not over $3 per ton. A cross-cut has been started at this depth to cut the smaller or N.E. vein, but had to be stopped for lack of air. These veins can be tapped at a depth of 2,000′ by driving 5,000′ of tunnel. Electric power can be developed for use at the mines at some waterfalls 5 miles distant. The country is well timbered. Two men are at work. G. Compton and D. Cate, of Quincy, owners.

*Kirkham Mine* (Placer).—It is on the south bank of the North Fork of Feather River, 4 miles E. of Butte Valley, at 3,425′ elevation, and contains 20 acres on a bar of the river. The pit is about 10′ deep and 50′ wide, and requires the use of a water-power derrick, with 40′ mast and 26′ boom, to remove the bowlders. Four men are employed. F. Ackels, F. Mori, et al., of Butte Valley, owners.

*Last Chance Mine* (Drift).—It is 3 miles S. of Butte Valley, at 3,400′ elevation, and contains 20 acres. It is being reopened by a drift (40′ long at present) to strike the Dutch Hill gravel channel; it will be necessary to drive about 150′ farther. One man is at work. S. Deane, of Butte Valley, owner.

*Last Chance Mine* (Placer).—It is on Grizzly Creek, 7 miles S. from Genesee, at 5,300′ elevation, and contains 40 acres on a former bench of Grizzly Creek. A cut 40′x 50′ and 15′ deep has been made into the gravel. Water is obtained from Clear and Grizzly creeks, through ½ mile of ditch of 200 miner's inches capacity. The tail-flume, 18″x 20″, is 45′ long, and furnished with pole riffles. Three men are at work. F. Duchaine, of Genesse, owner.

*Lee Mine* (Quartz).—See Crescent.

*Leete's Mine* (Quartz).—It is situated on the ridge between Indian and Round valleys, 2½ miles W. from Crescent Mills, at 4,875′ elevation, and comprises an agricultural patent of 160 acres, containing several parallel N. and S. veins; the one being developed is 20″ wide in granite, carrying free-milling quartz. A shaft 4′x 5′ has been sunk 120′ deep on the vein with a horse-whim, and is being continued. A second vein, 3½′ wide, has had a tunnel driven on it for several hundred feet. Seven men are at work. B. F. Leete, of Greenville, owner.

*Lewis Mine* (Quartz).—It is N. of and adjoins the Halsted claims 9 miles N.W. of Spanish Ranch, at 3,900′ elevation at tunnel. It consists of two locations. It is prospected by a cross-cut tunnel, which reaches the Halsted ledge 252′ in, where the vein is 28″ wide. In continuing the cross-cut 38′ a small, rich stringer, 2″ to 10″ wide, was cut and drifted upon S. 90′. The vein trends N. 65° W., and dips 80° N.E. Idle. Frank Hill, of Spanish Ranch, in charge.

*Lights Mines* (Quartz).—See California.

*Lily Mine* (Quartz).—See Florence Consolidated.

*Little Jamison Mine* (Quartz).—See Jamison.

*Lone Star Mine* (Hydraulic).—See Tefft & Co.

*Lost Channel Mine* (Drift).—It is on the E. side of Feather River 2 miles E. from Cromberg, at 4,800′ elevation, and comprises 160 acres on an old channel. The depth of the gravel and lava cap is 190′. A bedrock tunnel 220′ long has been driven and an upraise of 6′ made into the channel, but the latter has not been drifted across, nor has any gravel been washed to date. An incline sunk on the vein ½ mile above proved the presence of gold on the bedrock. Water is obtained from Jackson Creek, through 1½ miles of ditch with 3′ bottom and 300 miner's inches capacity, which can be delivered under 200′ pressure. Three men are at work. J. Neville, Langhorst Bros., and others, of Cromberg, owners.

*Lucky S. Mine* (Quartz).—See our Xth Report, p. 467. It is on Kettle Rock Peak, 11 miles N. from Taylorsville, at 6,800′ elevation. There are two locations, designated Lucky S. No. 1, and a 5-acre mill-site and a timber claim. The two veins, 4′ and 6′ wide, respectively, in the two claims, are parallel and about 600′ apart, coursing N.E. and S.W., and dipping 60° S.E., in granite. The main tunnel on No. 1 is a cross-cut 184′ to the ledge, with a 227′ drift, which gives 138′ of backs. Connecting with it is a 6′x8′ shaft 138′ deep, which is supplied with a hoist, a Worthington pump, and an 8 H.P. upright engine, consuming 1 cord of wood per day. On vein No. 2 is a 90′ cross-cut to the vein and a 288′ drift. The cross-cut was continued to strike a third parallel vein, but has not yet reached it. This tunnel is provided with an air-shaft 78′ deep. The mill site is on Peter's Creek, ½ mile from the mine, and the cost of hauling is 40 cents per ton. The mill contains 5 stamps of 750 lbs., crushing 8 tons per day. The pulp passes over 8′ of apron-plate and 6′ of sluice-plates, set on 1¼″ grade, to a rubber, thence on 6′ more of plate to a Johnston concentrator. The power is supplied by a 5′ Pelton wheel under 150′ pressure, with water from Peter's Creek. The tailings are impounded to be reworked. On account of the heavy snows prevalent the mill can be run only nine months in the year. On No. 2 a tunnel has been started 200′ below the present workings, to which point the mill will be removed, to avoid hauling the ore and to enable the mill to run throughout the year. Portions of the ore carry 5% of high-grade sulphurets. Timber of excellent quality abounds on the claim. Eleven men are at work. H. C. Langrehr, of Phelan Building, San Francisco, and others, owners; H. C. Langrehr, manager.

*Malvern Hill Mine* (Drift).—It is 2 miles E. of Butte Valley, at 3,550′ elevation, and comprises 80 acres of ground on the course of the Dutch Hill channel. The bedrock tunnel is 684′ long, with an upraise of 170′ in the north back rim; the rims are 200′ apart. Fifteen feet above the tunnel, in the upraise, a drift has been started. The course of the tun-

el is slightly to the E. and N. Two men are at work. E. Davis and . Bressler, of Butte Valley, owners.

*Mayflower Mine* (Drift).—It is 6 miles S. of Quincy, at an approximate elevation of 5,800′, and comprises 200 acres of what is supposed to be part of the channel that is being worked at Sawpit Flat. A 300′ tunnel has been driven, which will have to be extended 500′ to reach the supposed channel; 600 miner's inches of water, with 250′ pressure, can be obtained from the east branch of Rock Creek. Four men are at work. W. S. Webb, W. Edwards, et al., of Quincy, owners.

*McGill & Standart Consolidated* (*Drury and Pacific*) *Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 480 and 473. It is in North Cañon, 2 miles S. of Greenville, at 3,850′–4,000′ approximate elevation, and comprises four mining locations and two timber claims. The vein courses E. and W., and dips 80° N., between syenite walls, with a serpentine belt on the south of the syenite about 600′ from the vein. The ore is low-grade, but on account of favorable location can be mined and milled for $2 per ton. The mine has been developed through three tunnels from North Cañon. The chief workings are at present between tunnels Nos. 2 and 3. The upper portion of the mine is pretty well worked out, only a little stoping being done above tunnel No. 2, which is 2,000′ long and cut by a shaft designated the Pacific, beyond which are three pay-shoots. The breast of tunnel No. 2 is 350′ below the surface. Tunnel No. 3 is 250′ below No. 2, and follows 1,200′ on the vein. At 1,000′ from the mouth of the tunnel a cross-course cuts the vein; this shows itself in the company's ground first about 75′ above tunnel No. 2, where the apex is quite narrow, widening as it gains in depth. One of the pay-shoots, known as the "sulphuret shoot," contains a good grade of sulphurets, worth saving; heretofore no concentrators have been used. The 15-stamp water-mill crushes 20 tons per day. The ore is hauled out of the mine by horse-power, 5 one-ton cars to a train. Timber of fine quality is abundant. Sixteen men are employed in the mine. G. Standart and R. McGill, of Greenville, owners; G. Standart, superintendent.

*Megown Mine* (Quartz).—See our Xth and XIth Reports, pp. 484 and 324. It is 7 miles S.W. from Spanish Ranch, and consists of two locations. Since previous Report the tunnel has been extended and a lower one started, opening a good vein. Two men are at work. J. Megown, of Spanish Ranch, owner.

*Michigan Hill Mine* (Placer).—It is situated on Michigan Hill, about 5 miles N.E. from Quincy, at 3,325′ elevation, on bedrock. The course of the ancient channel is N.E. and S.W., and it is being worked 100′ wide along the E. rim. The gravel bank is 30′ high, with a pipe-clay capping from 2′ to 8′ thick, and red soil above, carrying the gold mostly on the bedrock, although some gold is found even in the soil. An area of 130′x 75′ was washed during the season, which lasts only three months, being slightly extended through the use of a reservoir that empties in 1½ hours. Water is diverted from Cashman Creek, near Hough's Peak, and is brought through 3½ miles of ditch, crossing a 325′ depression of Spanish Creek by a siphon pipe 1,300′ long and 22″ to 15″ diameter. The ditch is 2½′ in the bottom on a natural grade, and carries 200 miner's inches, delivered to one giant in the cut under 80′ pressure, through 600′ of 15″ and 11″ pipe. The tail-flume is 1,200′ long and 26″ wide, paved with wooden blocks, and set on a 10″ grade to the

box. It is cleaned up at the end of the season. J. B. Higgins, Quincy, owner.

*Morning Star Mine* (Quartz).—See Robinson.

*Mountain Chief Mine* (Quartz).—See our XIIth Report, p. 218. It on the main branch of Mill Creek, about 4 miles S.E. from Quincy, about 3,450′ elevation. Instead of a vein, a belt of slate, with inte stratified stringers of quartz with a general E. and W. course, is beir worked; some of these quartz stringers assume a width of several fe in places, as is shown where the creek has cut across the strata. Tl developments have been made through an open cut and a shaft 10 deep. The quartz has been crushed in a 12′ arrastra on Mill Creek, b proved to be very low-grade. Two men are at work. Judge J. Clough, of Quincy, owner.

*Mountain King* (*Butte Bar*) *Mine* (Quartz).—It is situated on th Middle Fork of Feather River, 10 miles S.W. from Quincy, and co sists of two claims, separated by the river, and designated as the *Brou Bear* and *Lucky S.* The 5′ vein courses nearly N. and S., between sla and a dike, and shows little or no free gold in the horn-spoon, but very heavy percentage of gold-bearing sulphurets. In an early day large pocket of free gold was taken from the vein on the river ban Two tunnels have been driven on the vein, 150′ and 70′ long. Idl Frank E. Thomas, of Quincy, owner.

*Musick & Schaefer* (*Blackhawk*) *Mine* (Placer).—It is 5½ miles N. Quincy, at 3,350′ elevation, and contains 160 acres. At present th work is confined to the bed of Blackhawk Creek, using water from Litt Blackhawk and Butterfly creeks through two ditches, 1 mile and miles long. Two men are at work. Musick & Schaefer, of Quinc owners.

*New Jersey Mine* (Drift).—See our XIIth Report, p. 218. It is 1 miles N. of Gibsonville, at 5,700′ elevation, and contains 240 acres o the N. end of Blue Mountain. T. Chapman, of Gibsonville, owner.

*Ninety-Three Mine* (Quartz).—See our XIIth Report, p. 218. It situated near Sulphur Creek Ranch, 5 miles from Mohawk.

*North Fork Mine* (Drift).—See Dutch Hill.

*North Star Mine* (Quartz).—See Robinson.

*Northern Mine* (Hydraulic).—It is 16 miles S.E. of Quincy, not fa from Cromberg, at 5,570′ elevation, and contains 480 acres of groun The present working-pit shows a bank 125′ high; 1,000 miner's inch of water are obtained from Little Long Valley Creek, through 3 mil of ditch, 3′ on bottom, 5′ on top, and 2½′ deep, with ⅝″ grade per rod, an delivered to a No. 4 giant under 210′ pressure. The water season las five months. There are several lines of tailrace, with an undercurre attached to the lowest series; they are set on a grade of 14″ to the bo and dump into Little Long Valley Creek, across which a series of fiv dams, from 150′ to 250′ long and 20′ high, in the center of creek-be have been built. Idle. Pitner Traynor, of Quincy, manager.

*Ohio Mine* (Placer).—See our XIIth Report, p. 218. It is 6 miles S.I from Mohawk, at about 6,000′ elevation, and contains 120 acres. J. Knickren et al., of Mohawk Valley, owners.

*Ohio Point Mine* (Quartz).—See Duncan.

*Oliver Quick Mine* (Quartz).—It is 5 miles N.E. from Merrimac, Butt County, at 4,700′ elevation. The 2′ N. and S. vein dips 70° E., in granite formation, and is developed through two tunnels; the upper on

300′, the lower 700′ long. The quartz carries 1½% of high-grade sulhurets. Two men are at work. J. Pappin, of Merrimac, Butte County, wner.

*Ophir Mine* (Drift).—It is 5 miles N. of Gibsonville, at 6,475′ pproximate elevation, and contains 2,000′ front and thence back to nter of ridge, on the course of the Gibsonville channel. A tunnel, 00′ long, to bottom of the channel, was laid too high; a second one has een started, which will have to be driven 240′ and then connected by praise with the channel. Six men are employed. W. E. Bainbridge, Gibsonville, owner.

*Ophir Mine* (Quartz).—See Crescent.

*Orr Mine* (Hydraulic).—See Plumas-Imperial.

*Phœnix Mine* (Quartz).—See John Bull and Phœnix.

*Pilot Hill Gold Mine* (Quartz).—See our XIIth Report, p. 218. It is ear the foot of Pilot Hill, at the head of Onion Valley, 6 miles N.W. om Gibsonville, at about 7,000′ elevation, and comprises six claims. . F. Turner et al., of Gibsonville, owners.

*Pipe Mine* (Placer).—It is an adjunct of the Hibernia quartz mine, nd is in McLellan Ravine, 2 miles S.E. of Greenville, at an elevation f 4,250′, and contains 70 acres. Water is obtained from the ravine nd the Round Valley Water Co.'s ditch. Idle. B. F. Gullic et al., of reenville, owners.

*Plumas-Eureka Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 476, 482, 330, and 219. It is ½ mile W. from Johnsille, its highest point being at 7,565′ elevation, and the lowest tunnel ,000′ elevation. Most of the present work is carried on in the old "76" round. Of the 60 stamps, only 15 are dropping. The water for power is rought through 4 miles of flume from Jamison Creek, and delivered nder 260′ pressure on an 8′ Knight wheel. A relay 75 H.P. steamngine is also on hand. Fifty men are at work. Sierra Buttes G. M. o. (Ltd.), of England, owners; Wm. Johns, of San Francisco, genral manager; — Thomas, of Johnsville, superintendent.

*Plumas-Imperial* (*Hungarian Hill and Orr*) *Mines* (Hydraulic).—See ur Xth and XIIth Reports, pp. 479 and 219. They consist of two laims, the *Emigrant Hill* and *Hungarian Hill*. The former is 2 miles . of Quincy and embraces 300 acres, and has never been worked, but s being prospected by shafts and tunnels. The latter is 4½ miles S.W. f Quincy, embraces 900 acres, ranging in altitude from 3,600′ to 4,035′. Work is being prosecuted on the Hungarian Hill claim, on a large body f gravel, at a place known as *Five Points*, where several cañons appear o have emptied into a single depression. Where the gravel bank has een faced up it is over 100′ deep, and carries different grades of gravel, nterstratified with pipe-clay and sand. Two ditch systems, known as he upper and lower, divert the waters from Dean's Valley, east and est branches of Rock Creek, Beaver, and Deer creeks. The upper or rincipal ditch is 9¾ miles long, with a capacity of 2,000 miner's inches; he lower ditch is 3 miles long, with a capacity of 800 miner's inches. he water is stored behind a dam at the head of Dean's Valley, formng a lake 15′ deep, which is drawn from as required. The pipe-line, ,000′ long, of 22″ diameter, is made of No. 14 iron. The former owners f this gravel deposit have never been able to bottom it. The present it shows a face 600′ to 700′ long and over 100′ high, with the bedrock till pitching. A bedrock tunnel had been driven from the Rock Creek

side to what was supposed to be the lowest point, and an upraise of 3 made to the gravel; this has lately been cleaned out, retimbered, and 4′ flume placed in the bottom, on an 8″ grade. Radial bedro cuts will lead to the upraise, to permit all the gravel being handl through this tunnel, which furnishes a 60′ dump into a flat formed by curve of Rock Creek. By extending the tunnel the Quigley Ravine si will also be passed through to the Rock Creek dump. This arrang ment will permit of a much larger area of gravel being handled ea season. One half mile below the dump in Rock Creek is a stone restrai ing dam, 30′ wide at the base, 17′ at the crest, 20′ high, and 85′ long fro bank to bank. A good wagon road has been constructed up Slate Cree connecting the mine with the county road between Quincy and Spani Ranch. To the present time only one giant, with 7½″ nozzle, has be used. The gravel carries gold throughout, though coarsest and best ne the bedrock; some of this gold is black and rusty. Eighteen men a employed at present around the mine, ditches, and flumes, but lat only seven men, working two shifts, will be required. C. D. Hazzar of Minneapolis, Minnesota, owner; — McGillvray, of Quincy, superi tendent.

*Quincy Mining and Water Co.'s Mines* (Hydraulic).—See our XIIt Report, p. 219. This property is situated on Gopher Hill and Shor Hill, along the north bank of Spanish Creek, about 3 miles W. of Quinc at 3,800′ elevation on bedrock, and comprises 2,200 acres. Five giant supplied with 6″ and 8″ nozzles, are used in the three different pits. Gopher Hill the bank is from 80′ to 100′ in height; at the City Poi claim, gravel is 10′ to 12′ deep on the north end and 50′ on the sout end; on the N.E. side there is 15′ of reddish quartz gravel. Last seaso 200,000 cu. yds. of gravel were moved. There are three radiating branc sluices 3,000′ long, 4′ wide, set on a 6″ grade, paved with rock riffles, an cleaned up every twenty days. It is said 1,000 miner's inches of wat move 1,000 cu. yds. of gravel in thirteen hours. The gold is coarse and nu gety, and is found mostly on the bedrock. The bedrock is cleaned twic one season after the other. The company have built four restrainin dams, the upper one of gravel, across Wanponsey Creek. The debr drops in a lake 12′ to 15′ deep, and after settling passes over a spillwa to the second and third dams. These dams are 300′, 800′, and 20 apart. The upper dam is 22′ and the second 20′ high. The company water-supply is obtained from Gold and Silver lakes on Spanish Peal and from Bean and Spanish creeks. The main ditches are 24 mil long, carrying about 2,000 miner's inches, and the branch ditches 5 miles long, carrying from 500 to 1,000 miner's inches. The pressu from the main reservoir is 350′, and gives ten hours piping. The pip line, 22″ and 11″, made out of No. 12 iron, is between 5,000′ and 6,000 Twenty men are employed. An incorporated company, of Quincy owner; A. B. White, of San Francisco, superintendent.

*Rattlesnake Mine* (Drift).—See Ding Dong.

*Rich Gulch Mine* (Quartz).—See Halsted.

*Richmond Hill Mine* (Hydraulic and Drift).—See Good Hope.

*Riverdale Mine* (Drift).—See Elizabethtown Gravel Channel.

*Robinson* (*Morning Star and Trenton*) *Mine* (Quartz).—It is situated i Granite Basin, 8 miles N.E. from Merrimac, Butte County, and contain two locations, designated the *North Star* and the *Trenton*, at 4,75 elevation. The vein, 2′ to 4′ wide, trends N.E. and S.W., and dips 80

E., between a granite and diorite contact. Frazier Creek divides the o claims. Developments consist of a 3½′x 6′ shaft, 70′ deep, with eam hoisting plant. The quartz in the bottom of the shaft carries ⅛ of high-grade sulphurets. A No. 3 Hooker pump is driven, with a eed of 30 strokes per minute, by a 14 H.P. engine. The 20-stamp ater-mill (with only one battery in running order) is situated on razier Creek, a short distance from the shaft, and is connected with it r a tram-road. The mill has 900-lb. steel-shod stamps and one John- on concentrator driven by a 5′ Knight wheel, under 94′ pressure. The ater is diverted from Frazier Creek, through 1,650′ of ditch of 200 iner's inches capacity. Tunnels have been run on the vein from both les of the creek, the four on the North Star being 400′, 260′, 300′, and 40′ ng, respectively, with the intervening ground mostly stoped out. The nnel on the Trenton is 200′ long, with some little stoping. The shaft n this vein is the deepest of any mine in the basin. Seven men are nployed. E. C. Robinson, of Merrimac, Butte County, owner.

*Round Valley Consolidated* (*Arcadian*) *Mining Co.'s Mine* (Quartz).— is on the E. side of North Cañon, 2 miles S.E. of Greenville, at 900′ elevation, and contains four locations and a mill site. There is a ain N. and S. vein and two E. and W. feeders, 6′ wide, dipping nearly ver- cally. The developments consist of a main cross-cut tunnel (at pres- nt inaccessible) 700′ long to the vein, near the south end of the claim; ience a drift 500′ to the north country with a shaft; the John Taylor nnel, 450′ long, striking one of the feeders, and developing three pay- noots between where the vein is tapped and where it connects with the . and S. vein; pay-shoots have likewise been cut on the other veins. he quartz is low-grade. The 10-stamp steam-mill, with 750-lb. stamps, furnished, besides the plates, with two rubbers, but no concentrators. imber is abundant. Idle. An incorporated company, of Greenville, vner; D. McIntyre, of Greenville, manager.

*Russian Mine* (Drift).—This is a prospect on the course of the old utch Hill channel, 11 miles from Prattville, at 4,025′ elevation, and mprises 60 acres, on which a bedrock tunnel has been started. B. iazzonia and J. Borsini, of Butte Valley, owners.

*Salmon Falls Mine* (Drift).—See our XIIth Report, p. 220. Assessment ork only. D. McIntyre et al., of Greenville, owners.

*Savercool Mine* (Quartz).—See our Xth Report, p. 493. It is situated miles E. of Butte Valley, on the North Fork of Feather River, at 4,000′ evation. Idle. Savercool Bros. et al., of Butte Valley, owners.

*Sawpit Flat Mine* (Hydraulic and Drift).—See Good Hope.

*See & Seren Mine* (Quartz).—See Specimen.

*Senator Perkins Mine* (Quartz).—It is 5 miles N.E. of Merrimac, Butte ounty, at 4,750′ elevation. The vein courses N.E. in the granite. The evelopments consist of a 30′ tunnel and a 20′ open cut. The quartz rries high-grade sulphurets. Two men are at work. — Blazel, of akland, owner.

*Shenandoah Mine* (Quartz).—See our XIth and XIIth Reports, pp. 24 and 220. It is at the head of French Ravine, 12 miles N.W. of Span- h Ranch, at 2,350′ elevation, and comprises three quartz and two placer laims. The developments include three tunnels on the vein, 160′, 50′, nd 100′ long, and a 45′ winze from tunnel No. 1 sunk on the pay-shoot. he large percentage of sulphurets found in the ores interferes with the uccessful milling; at least the tailings are found to carry a high per-

centage of gold, and new and better methods are being sought. The 1
stamp mill was run by water obtained from Clear Creek through 1
miles of ditch of 350 inches capacity. The climatic conditions ar
locality make it troublesome to work the property in winter. Two me
are at work. An incorporated company, of Oakland, owner.

*Siebbert Mine* (Quartz).—See Homestake.

*Silver Star Mine* (Hydraulic and Placer).—It is about 1½ miles W
from Spanish Ranch, at 3,500′ elevation, and includes 80 acres
ground. The 15′ bank carries 4′ to 5′ of gravel next to a false bedroc
Three acres have been worked. The mine has been enjoined, hen
only the creek-bed can now be worked by ground-sluicing. Water
obtained from Silver Creek through two ditches 2 miles long and 20
apart, but finally uniting; the grade is ¾″ to the rod and 250′ pressu
is obtained. A pipe elevator, with a 15″ discharge pipe and a 4″ nozz
below, was in use here, to raise the tailings 24′ high; 2,200′ of piping,
18″ and 11″ diameter, was used, including the 200′ branch to th
elevator. The tail-flume is 600′ long and has 30″ bottom and bloc
riffles. Taylor Bros., of Spanish Ranch, owners.

*Soda Bar and Eclipse Mine* (Placer).—It is 9 miles S.W. fro
Crescent Mills, at 2,800′ elevation, and contains 80 acres. This grav
deposit is on a bench of Soda Creek, and varies in depth from 3′ to 40
the present bank has a 20′ face. The gold is coarse, partly quartz-gol
and all next the bedrock. Water is taken out of Soda Creek through
short ditch, furnishing 150′ pressure during the season, lasting eigh
months. Although very heavy bowlders are found next to bedrock, n
derrick is used. The tail-flume is 84′ long and 20″ wide, set on a grad
of 18″ per box, and paved with Hungarian and pole riffles. Five me
are employed. W. Edwards and G. M. Cooksey, of Quincy, owners.

*Sonoma Mine* (Quartz).—It is 8 miles N.E. from Merrimac, Butt
County, at 4,950′ elevation. The location embraces two veins, 18″ t
24″ wide and 100′ apart, coursing N.E. and S.W., and dipping 80° S.E
in granite. The quartz carries 1½% of sulphurets. The veins ar
developed through a tunnel 180′ long, cutting both veins, with drifts o
both, giving 60′ of backs. An 8′ continuous-working arrastra, supplie
with screens, is driven by a 15′ overshot wheel, 20″ breast, with wate
from Buckhorn Creek. Three men are employed. Murphy & Son, o
Merrimac, Butte County, owners.

*Specimen* (*See & Seren*) *Mine* (Quartz).—See our Xth Report, p. 490
It is in Granite Basin, 8 miles N.W. from Merrimac, at 4,900′ elevation
A new tunnel, above the former tunnels, has been driven to the vein
and the pay-shoot tapped. Four men are employed. See & Jolly, o
Merrimac, Butte County, owners.

*Sunnyside Mine* (Drift).—See Gladiator.

*Sunnyside Mine* (Drift).—It is 2 miles S.W. of Butte Valley, an
contains 220 acres on the Dutch Hill channel, at an elevation of 3,550
at tunnels. At different times during the past twenty years fou
tunnels have been driven to tap this channel, all of which were to
high, bedrock never having been reached. Under the present manage
ment a new tunnel (now 50′ long) has been started near the mouth o
Clear Creek, and will be below the lowest point of the channel. Th
lowest of the old tunnels was 800′ long, and a gangway, 5′ in the clear
was driven 160′ across the channel. A very large amount of wate
flows from the mine, which is used for washing the gravel. The breast

re carried 25′ wide and 5′ high. The gravel is tight, requiring the use f powder. A breaster can dig 4 to 5 cars, each of 1,500 lbs. capacity, er day. All bowlders are stowed. There are neither lava bowlders or clay in the gravel. There is a dump of several hundred feet into ne North Fork of Feather River. The water from the mine is retained n a 10′x 12′x 5′ tank, which fills in ten minutes; the gravel is washed hrough six 14″ boxes, set on an 18″ grade per box. Ten men are mployed. Col. Day, of Butte Valley, owner.

*Swan Mine* (Quartz).—See Homestake.

*Swiss Mine* (Drift and Quartz).—It is 11 miles W. of Prattville, at ,025′ elevation, and comprises 45 acres between Sunnyside and Dutch Hill. An 800′ drift, through the slate rim and lava, cuts the gravel on bench of the channel, which was breasted 100′ across, with bedrock itching away. The course of the channel was N.E., and extremely arge bowlders were found mixed with the gravel; in spots the gravel arried considerable clay. The gold is coarse and heavy. A breaster an dig 7 cars of 1,500 lbs. each per day. The gravel is washed through 0 boxes, with 14″ bottoms and 1½″ grade to the foot, paved with Hungarian and pole riffles. The boxes are cleaned up every night. Water is obtained from Owl Creek through 200′ of 11″ pipe. Crossing he company's ground is a quartz vein, 12′ to 20′ thick, coursing N. nd S., and dipping 55° W., in slate walls. It was cut in the bedrock unnel, giving 115′ of backs, and carries a considerable percentage of ron sulphurets. The outcrop of the vein is largely lava-capped. Two nen are employed. B. Piazzonia, of Butte Valley, owner.

*Taylor Diggings Mine* (Hydraulic).—See California Gold Mining and nvestment Co.

*Tefft & Co.'s* (*Lone Star and Concordia*) *Mine* (Hydraulic).—It is near Cromberg, 18 miles S.E. of Quincy, and comprises 400 acres on two djoining claims, designated as the *Lone Star*, containing 160 acres, at n elevation of 4,700′, and the *Concordia*, with 240 acres, at 5,450′ elevaion. At present the mine has been temporarily enjoined for noncompliance with some of the Debris Commissioner's regulations. The pit in the Lone Star is about 20′ deep, extending 600′ and about 300′ across; the average depth of gravel is about 10′. This has the appearnce of being a break, or "spill over," from the main channel, coursing N. and S. further in the hill upon which the Concordia is situated. One monitor, with 11″ inlet and 5½″ nozzle, working under 300′ pressure, s used in the Lone Star ground; also a 1 H.P. derrick, with 30′ boom. The pipe-line is 1,700′ long, reducing from 22″ to 11″. Water is obtained rom Long Valley and Jackson creeks, with three systems of ditches; he Lone Star ditch is 3½ miles long, 6′ on top, 4′ on bottom, and 3′ deep, carrying 1,500 inches of water; the Jackson ditch is 7′ on top, 5′ on bottom, 3′ deep, and 1½ miles long; the irrigation ditch is 5′ on top, 3′ on bottom, and 2½′ deep. Aside from these, Coggswell Ravine furnishes some water during three months in the spring. It is said the cost of construction of the Lone Star ditch was $20,000. For the Concordia claim he water is brought through the Concordia ditch, 5 miles long, 3′ on bottom, and of 600 miner's inches capacity. The water season is three months in the spring, and is somewhat extended through reservoirs, which permit from three hours to five hours piping per day. There are 1,400′ of 42″ tail-flume, set on a 5½″ grade, and paved with 9″ blocks. The debris from this claim dumps into Coggswell Ravine

behind the Lone Star dam, which is built across Jackson Creek, and i of stone, 1,500′ long, 40′ wide on bottom, and 41′ high in center, provic ing a restraining area of 100 acres; 1,500′ beyond is a "logskidded dam, 12′ high on the lower side, for a settling pond. Tefft & Co., c Cromberg, owners; W. deVinney, of Cromberg, manager.

*Telge Mine* (Quartz).—It is 4 miles N.W. of Genesee Valley, at 5,55( elevation. The vein is 5′ wide, courses N.E., and dips 50° N.W., i granite. A 300′ cross-cut tunnel has been run to the ledge, and drifte 75′ south on the vein. An incline on the vein above the tunnel is dow 35′. The cross-cut furnishes 250′ of backs. The ore carries coppe sulphides. Two men work part of the season. Barney Telge, of Ren Nev., owner.

*Toland & Langdon's Mine* (Hydraulic).—It is 2½ miles N.W. fro Spanish Ranch, and contains 40 acres. Water is used from Burto Ravine and Clear Creek.

*Trenton Mine* (Quartz).—See Robinson.

*Tucker & Brown Mine* (Placer).—It is 2 miles W. of Spanish Ranch at 3,000′ elevation, and contains 20 acres. The ground is heavily tim bered, and the gravel worked is from 4′ to 10′ deep, resting on a hardpan the bedrock proper has never been reached. The gold is of mediun size. Water is obtained from Clear Creek, through 3 miles of ditch of 40( miner's inches capacity. Three men are employed. Tucker & Brown of Meadow Valley, owners.

*Ward Mine* (Quartz).—See Genesee Valley.

*White Oak Mine* (Quartz).—See Black Oak.

*Wildcat Mine* (Drift).—See our XIIth Report, p. 220. It is 10 mile S. of Prattville. S. Cameron, of Prattville, manager.

*Workman Mine* (Quartz).—It is on the Little North Fork of Middl Fork of Feather River, 5 miles N.E. from Merrimac, at 4,700′ elevation The vein is 2′ wide, heavily sulphuretted, courses N.E. and S.W., anc dips 60° S.E., in granite. The developments are carried on through tw tunnels. Two men are at work. W. B. Harbin, of Merrimac, Butte County, owner.

*Yankee Bar Mine* (Placer).—It is on the North Fork of Feather River 3 miles S.E. of Butte Valley, at an elevation of 3,400′. The pit is 50 wide and gravel 14′ deep, with a large amount of bowlders, requiring a derrick with 42′ boom, and driven by a 11′ overshot water-wheel. The gravel contains coarse gold throughout, partly black and rusty. Twelve lengths of 14″ flume are used, with Hungarian riffles and poles for washing. Two men are at work. S. Dean, of Butte Valley, owner.

*Yellow Creek Mine* (Placer).—It is on Yellow Creek, 18 miles W. from Spanish Ranch, at 2,000′ elevation, and contains 40 acres along the creek. The pit is 20′x 40′, and the gravel is 6′ to 7′ deep. A hand-derrick, with 25′ mast, and a Chinese pump, run by an undershot wheel 8′ in diameter and 14″ wide, are used. The tail-flume is 150′ long and 12″ wide, set on an 8″ grade, and cleaned once a week; the gold is coarse. The wingdam incloses an area of 40′ wide and 200′ long. Two men are employed. S. P. Maxwell, of Spanish Ranch, owner.

*Yet Lee Co. Mine* (Placer).—This is 2 miles S. from Rich Bar, on Long Bar, at 2,000′ elevation, and contains 40 acres. The pit is 20′ deep, with 12′ original gravel. A water-power derrick (overshot), using 40′ mast, and a Chinese pump, run by a 12′ current-wheel, are used, and 150′ of 14″ flume are required for washing. Fourteen Chinese are at work. A Chinese company, owner.

## MILLS IN PLUMAS COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 21 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Butterfly | Steam | 10 | 800 | 14 | 1 | Frue | | | (Gold King Amalg.) | |
| Centennial | | 10 | | | | | | | | |
| Coquette | Water | 10 | 750 | 15 | | | | | | |
| Crescent | Steam | 30 | 800 | 60 | | | | | | |
| Fall River Consolidated | Water | 5 | 750 | 7½ | 1 | Frue | | | | |
| Four Hills | | 10 | 1,000 | | | | | | | |
| Gallagher | Water | 8 | 650 | 4 | | | | | | |
| Genesee Valley* | Water | 10 | 650 | 12 | 2 | | | | | |
| Green Mountain | Water | 30 | 750 | | | | | | | |
| Graves | Water | 4 | 275 | 3 | | | | | | |
| Hibernia | Water | 10 | 750 | 20 | | | | | | |
| Homestake | Water | 5 | 450 | 3 | | | | | | |
| John Bull and Phœnix | Water | 5 | 750 | 7½ | | | | | | |
| Kettle | Water | 20 | 850 | 50 | | | | | | |
| Lucky S. | Water | 5 | 750 | 8 | 1<br>1 | Rubber<br>Johnson | | | | |
| McGill and Standard Consolidated | Water | 15 | 750 | 18–20 | | | | | | |
| Plumas Consolidated | Water | 24 | 850 | 36 | | | | | | |
| Plumas-Eureka | W. & S. | 60 | 750 | 30 | 24 | Hendy | | | | |
| Round Valley | Steam | 10 | 750 | 20 | 2 | Rubber | | | | |
| Robinson | Water | 20 | 900 | 30 | 1 | Johnson | | | | |
| Shenandoah | Water | 10 | 750 | 15 | | | 1 | 5 tons. | (Gold King Amalg.) | |
| Specimen | Water | 4 | 500 | 4 | | | | | | |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN PLUMAS COUNTY

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs. in Tons. |
|---|---|---|---|---|---|
| Black Oak | | | Arrastra | | 1 |
| Cleveland | Water | 2 | Arrastra | | 4 |
| Diadem | | 1 | Huntington | | |
| Frazier* | Steam | 1 | Huntington | | 20 |
| Genesee Valley | | 1 | Arrastra | | |
| Mountain Chief | | | Arrastra | | 4 |
| Sonoma | Water | | Arrastra | | 4 |

*The Frazier Mill has one Triumph concentrator.

## Riverside County.

*Alice Mine* (Quartz).—See our XIIth Report, p. 221. It is 4 miles S of Menifee, at 1,500′ altitude. Since our last Report some developmen work has been done and a 5-stamp mill erected, but all operations ar now suspended. Estate of J. M. S. Egan, of Perris, owner.

*Barker Mine* (Quartz).—It is situated near Warren's ranch, about 2 miles N.E. of White Water Station. It is reported that the develop ments have exposed a promising vein of gold-bearing quartz. C. C Baker, of Banning, owner.

*Bowlder Mines* (Quartz).—This property is 45 miles N.E. of Saltor and comprises claims in the Hathway and Eagle mountains. Consider able development work has been done within the past two years. I prospecting for water, several shafts were sunk, one of which is said t be 450′ deep, but dry. Water has been found at 75′ from the surface i the desert wash, 10 miles from the mines. A "Wiswell" mill will b built at once. The principal claim is the *Bowlder*, situated in the Hath way Mountains, at 2,000′ altitude. The workings consist of three shafts 30′, 50′, and 110′ deep, respectively; a 200′ tunnel on the vein, an several superficial cuts. The vein strikes N. and S., and is nearly ver tical. Bowlder Mining Co., of Los Angeles, owner; E. J. Delano, c Salton, superintendent.

*C. & C. Consolidated Mine* (Quartz).—It is 4 miles W. of Perris, a 1,800′ elevation. A 150′ tunnel has been driven, and a shaft is no being sunk on a small vein in granite. J. B. Dennis, of Perris, owne

*Coffee Mine* (Quartz).—It is in the Chuckawalla Mountains, 4 mile S. of Corn Springs. A 56′ shaft has been sunk on an 18″ vein at th northeast end of the claim, jointly with the *Ritchie* Mine. The vei strikes N.W. Coffee & Co., of Salton, owners.

*Colorado* (*Justice*) *Mine* (Quartz).—It is 4 miles S.W. of Perris. I was worked some years since in a small way. Idle. Knight et al., c Perris, owners.

*Columbus Mine* (Quartz).—See Monte Negras District.

*Desert Queen* (*McHeney*) *Mine* (Quartz).—It is 28 miles N. of Indi It has been superficially worked quite extensively during the past tw years. Some of the quartz has been so rich in gold as to cause the mos extravagant reports of the value of the mine. The rock is crushed in 5-stamp mill, located near a well, 6 miles from the mine. A small forc

Good Hope Mine.

Santa Rosa Mine.

is employed. C. M. Thompson, of Pasadena, owner; H. C. Steele, of Banning, superintendent.

*Fish Mine* (Quartz).—It is 6 miles N.E. of Dos Palms, a station, and about 12 miles N.E. of Salton, at 1,000′ elevation. A 90′ tunnel has been run and other superficial work done on a vein of gold quartz. A 2-stamp mill, to be run by a gasoline-engine, is now being built at Cañon Springs, 6 miles from the mine, to which the ore will be hauled. A. C. Fish, of San Bernardino, owner.

*Free Coinage and Charity Mines* (Quartz).—See our XIIth Report, p. 221. These claims join and are situated 18 miles N. of Durmid Station and 5 miles from Cañon Springs. E. E. Bowles, of Salton, owner.

*Gavilan Gold Mines* (Quartz).—They are on the San Jacinto Estate, 8½ miles N.W. of Perris, at 2,200′ altitude. There are twenty-seven claims in the group, upon some of which prospecting is being done, but no active mining operations are in progress. H. B. Varcoe, of Perris, agent.

*Golden Chariot Mine* (Quartz).—It is 5½ miles W. of Perris, and is the south extension of the Santa Rosa Mine. The main shaft, 310′ deep, is at 2,360′ elevation, and one level has been run, near the bottom. The vein strikes N. 10° W., and dips 55° to 45° W. A 20 H.P. steam-power plant is employed in hoisting. The mine has no mill. Seven hundred gallons of water are raised from the mine daily by a steam pump. Charles L. French, of Redlands, owner; J. M. Day, of Redlands, superintendent.

*Good Hope Mine* (Quartz).—See our VIIIth, IXth, XIth, and XIIth Reports, pp. 527, 151, 106, and 221. Since our last Report the mine has been in litigation, and idle the greater part of the time. It is understood operations are about to be resumed, under the ownership and management of the former owner. I. Siegenfuss, of Perris, owner.

*Gypsy Mine* (Quartz).—It is 4 miles W. of Virginia Dale, and about 50 miles N. of Walters Station, at 1,800′ altitude. A 115′ shaft has been sunk on a vein which dips 66° W., and strikes N. and S. Drifts have been run at 50′ and 100′ from the surface. Hoisting has been done with a horse-whim. A 1-stamp mill has been built on a dry lake near this mine for the purpose of prospecting this and other claims in this region. The mill will be operated by a gasoline-engine. Esler, Ingersoll, et al., of San Bernardino, owners.

*Hexahedron Mine* (Quartz).—See our XIIth Report, p. 223. It is 25 miles N.E. of Indio. Some prospecting and development work have been done since our last Report, showing a good grade of gold-bearing rock. Tingman & Holland, of Indio, owners.

*Indian Queen Mine* (Quartz).—It is 4½ miles W. of Perris, and is a new prospect. A 65′ shaft has been sunk on a vein, striking N.W. and dipping 70° S.W. A small steam hoist and a 5-stamp steam-power mill comprise the surface equipment. It is also supplied with a 4″ Cornish pump. J. B. Dennis, of Perris, owner.

*Ingersoll* (*Ramona*) *Mine* (Quartz).—It is 50 miles N.E. of Walters Station in the Monte Negras District. The vein strikes N. and S., and is nearly vertical. It varies from 1′ to 3′ in width. There are two shafts, 40′ and 80′ deep, respectively. Elser, Ingersoll, et al., of San Bernardino, owners.

*Jumbo Mine* (Quartz).—It is 5 miles W. of Perris, at 2,200′ altitude The vein strikes N. 10° W., and dips 80° W. A 50′ shaft has been sunk with a windlass. The vein is small. M. E. Bethurum, of Perris, owner

*Justice Mine* (Quartz).—See Colorado.

*Lane Mine* (Quartz).—It is a prospect, in the Hathway Mountains with superficial development. The quartz is crushed in an arrastra Lane & Son, of Salton, owners.

*La Plomo* (Quartz).—See Victor.

*Leon Mine* (Quartz).—See our XIIth Report, p. 223. It is on the Briggs ranch, 14 miles S.E. of Perris. The vein strikes N.W., and dips 85° S.W. The main shaft is now 150′ deep, and sinking is continued with a horse-whim. No mill. S. R. Porter et al., of Winchester owners; S. R. Porter, superintendent.

*Little Maggie Mine* (Quartz).—See our XIIth Report, p. 223. It is 4 miles W. of Perris. The vein strikes E., and dips 45° S. There are two inclined shafts, 175′ and 100′ deep, respectively. Idle. J. M. Hassen of Perris, owner.

*Little Pete Mine* (Quartz).—It is 4 miles W. of Perris, at 2,000′ elevation. A 30′ incline has been sunk on a small E. and W. vein containing arsenical pyrite. J. B. Dennis, of Perris, owner.

*Lost Horse Mine* (Quartz).—See our XIIth Report, p. 223. It is 20 miles N. of Indio, at 5,000′ elevation. Since our last Report development work has been steadily continued. An 80′ tunnel has been driven on the vein, a 50′ winze sunk, and a 50′ drift run east from the bottom of the winze. The greater portion of this work is in good rock. A 235′ vertical shaft has also been sunk with a horse-whim. A 2-stamp mill has been built 5 miles N. of the mine, near some springs. Ryan & Kelsey, of Banning, owners.

*Lucky Boy* (*Walker*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 385 and 223. It is on the Walker ranch, 2 miles S. of Menifee. Two shafts, 50′ and 60′ deep, respectively, have been sunk on a small vein. As water proved troublesome a pump was placed in the mine, and is operated by a gasoline-engine. L. Walker, of Menifee owner.

*McHeney Mine* (Quartz).—See Desert Queen.

*McKinley Bill Mine* (Quartz).—See O. K.

*Mammoth Mine* (Quartz).—It is 9 miles S. of Perris, at 1,600′ elevation. The vein averages 7′ thick, ranging from 4′ to 10′, strikes apparently N.E., and dips 15° N.W. The croppings are exposed 400′ around the side of the hill. Superficial cuts have been made at various points, and at the end of the 100′ cut a 200′ incline extends on the vein. A cross-cut connects with an air-shaft, 60′ to the surface. The inclosing rock is grano-diorite. The quartz of the vein is evenly impregnated with pyrite and shows free gold at many places. The prospects are encouraging. Stephens & Banta, of Menifee, owners.

*Menifee Mine* (Quartz).—See our XIth Report, p. 385. It is 8 miles S. of Perris, at 1,500′ altitude. The 100′ shaft is being extended. There are three other shafts, 30′, 55′, and 125′ deep, respectively. The vein strikes N.E., and dips 75° N.W. The surface plant consists of a steam hoist and a 5-stamp mill. H. N. McGready et al., of Menifee, owners.

*Messenger Mine* (Quartz).—It is on Eagle Mountain, 40 miles N.E. of Walters Station. The vein is from 3′ to 4′ wide, and from the 100′ shaft

50′ drifts have been run N. and S. W. H. Bradley, of Boyle Heights, Los Angeles, owner.

*Missing Link* (*Virginia-Shay*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 526, 385, and 225. It is in Pinacarte District, 6 miles W. of Perris. Idle for the past two years. J. B. Dennis, of Perris, owner.

*Monte Negras District.*—See our XIth and XIIth Reports, pp. 368 and 224. This district lies about 50 miles N.E. of Walters Station, between Virginia Dale and Eagle Mountain, and first came to public notice in the spring of 1892; since then considerable prospecting has been done, claims abandoned and relocated. Within the past year two mills have been built on Virginia Dale side, where water is obtained by sinking wells in the desert valley. On the south side no water has been found nearer than Cottonwood Springs, 25 miles distant. Ore is now being hauled from the claims on the south side of the district to an arrastra at Cottonwood Springs. These claims are the *Columbus*, *Porcupine*, *Republican*, *Summit*, and *Venus*. Shallow shafts and short tunnels have been made on each.

*O. K. Mine* (Quartz).—It is 18 miles N.E. of Indio, at 3,000′ elevation, and is a new prospect having a 30′ shaft. Tingman & Holland, of Indio, owners.

*O. K.* (*McKinley Bill*) *Mine* (Quartz).—It is in the Monte Negras District, 50 miles N.E. of Walters Station. The vein occurs in diorite, and is from 1′ to 4′ wide. Two shafts, 30′ and 40′ deep, respectively, have been sunk on the vein, and preparations made to haul ore to the mill at Virginia Dale. Esler, Ingersoll, et al., of San Bernardino, owners.

*Onward Mine* (Quartz).—See our XIIth Report, p. 224. It is 45 miles E. of Danby, between Virginia Dale and the Colorado River. The property is in the prospective stage. L. Gray & Bro., of Phœnix, Arizona, owners.

*Ophir Mine* (Quartz).—It is 6 miles S.W. of Perris, at 1,650′ altitude. A 100′ shaft has been sunk on a small vein in granite. The hoisting engine has been removed. There is a Huntington mill on the property. Perris Mining and Development Co., of Perris, owner; Fletcher Mott, superintendent.

*Perris Mine* (Quartz).—It is 5 miles W. of Perris, at 2,200′ altitude. A shaft has been sunk 60′ on an E. and W. vein, dipping 80° S. A 25′ drift has been run E. from the bottom of the shaft. The fissure is a heavy one, in granite, being accompanied by a dike, but there is little quartz in the crevice. W. F. Bray, of Perris, owner.

*Pinon Mountain Mines* (Quartz).—See our XIIth Report, p. 224. A small force is employed working on the several claims of the group. The ore is crushed in a 2-stamp mill near the mines. L. B. Woodworth, of Los Angeles, owner.

*Porcupine Mine* (Quartz).—See Monte Negras District.

*Ramona Mine* (Quartz).—See Ingersoll.

*Republican Mine* (Quartz).—See Monte Negras District.

*Ritchie Mine* (Quartz).—It is in the Chuckawalla Mountains, 4 miles from Corn Springs, and is worked jointly with the *Coffee Mine*. Ritchie & Co., of Salton, owners.

*Rosalia Mine* (Quartz).—See Santa Rosa.

*San Diego Mine* (Quartz).—See our XIIth Report, p. 224. It is in the Chuckawalla Mountains, 45 miles N.E. of Salton. Some development

work has recently been done on this property, with encouraging results. E. E. Bowles et al., owners.

*Santa Fe Mine* (Quartz).—See our XIIth Report, p. 224. Within the past two years a cross-cut tunnel has been driven 700′ into the hill to intersect the vein exposed on the surface and in the incline shaft. To all appearances this tunnel cut the vein nearly 500′ from its mouth, but the fact was not recognized by the miners. A 5-stamp mill has been erected on the property, but is idle. F. M. Woods et al., of Pomona, owners.

*Santa Rosa* (*Rosalia*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 526, 385, and 225. It is 5½ miles W. of Perris, at 2,200′ altitude. There are two incline shafts, 125′ and 420′ deep, respectively. The surface plant consists of a steam hoist and a 20-stamp steam-power mill. The vein strikes N. 10° W., and dips 45° W. The mine was not in operation at the time of the visit of the Field Assistant, and an inspection of the mine was not permissible. It is claimed that two shoots of quartz have been exposed in the workings. Santa Rosa Mining Co., of Boston, Mass., owner; G. W. Commons, of Perris, superintendent.

*S. S. Mine* (Quartz).—See our XIIth Report, p. 224. It is in the Virginia Dale region, near Lyon's well. T. B. Lyon, of San Bernardino, owner.

*Summit Mine* (Quartz).—See Monte Negras District.

*Stanford Mine* (Quartz).—See our XIIth Report, p. 225. It is 5 miles S.W. of Perris. Idle. Hearn Bros., of Perris, owners.

*Sterling Mines* (Quartz).—This property consists of a group of claims, 30 miles N.E. of Salton, in the Hathway Mountains, at 2,000′ altitude. Considerable superficial work has been done, and a 10-stamp mill is now building near the mines. The Sterling Mining Co., of Los Angeles, owner; — Bowers, of Salton, superintendent.

*Venus Mine* (Quartz).—See Monte Negras District.

*Victor* (*La Plomo*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 527, 384, and 225. It is 4½ miles S.W. of Perris, at 2,200′ altitude. Idle. H. C. Steele, of Perris, owner.

*Virginia Dale Mines* (Quartz).—This property comprises a group at and near Virginia Dale, 55 miles N.E. of Walters Station. The veins are from a few inches to 2′ in width. Active work was commenced on these mines in the summer of 1896, and a 5-stamp mill moved from 29 Palms to the vicinity of the mines. Rev. M. Phelps et al., of Pasadena, owners.

*Virginia Mine* (Quartz).—See Missing Link.

*Walker Mine* (Quartz).—See Lucky Boy.

## MILLS IN RIVERSIDE COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Alice | | 5 | 850 | | | | | | | |
| Desert Queen | | 5 | 850 | 10 | | | | | | |
| Fish | Gasoline | 2 | 750 | 3 | | | | | | |
| Gipsy | Gasoline | 1 | 700 | 2 | | | | | | |
| Good Hope | | 20 | 850 | | 8 | | | | | |
| Indian Queen | | 5 | 400 | 5 | | | | | | |
| Lost Horse | Steam | 2 | 850 | 4 | | | | | | |
| Menifee | | 5 | 750 | 10 | | | | | | |
| Pinon Mountain | Steam | 2 | 850 | 4 | | | | | | |
| Santa Fe | | 5 | 500 | 10 | | | | | | |
| Santa Rosa | Steam | 20 | 850 | 50 | | | | | | |
| Stanford | | 5 | 500 | | | | | | | |
| Virginia Dale | | 5 | 750 | | | | | | | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN RIVERSIDE COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Lane | | | Arrastra | | | | | | | | |
| Monte Negras | | | Arrastra | | | | | | | | |
| Ophir | | 1 | Huntington | 3′ | | | | | | | |

## Sacramento County.

The resources of Sacramento County are both mineral and agricultural. With the decadence of the former, there has been a steady development of the latter, until to-day the county has thousands of acres of land in the highest state of cultivation. Close proximity to large local markets and cheap transportation favor the farmer. The mineral industry is confined chiefly to the placer and drift mines along the lower foothills from the American to the Cosumnes River. In addition to these may be mentioned the extensive quarries of granite and macadam at the Folson Prison, the various manufacturing establishments for converting clay into pottery, brick, sewer-pipe, etc. The prison buildings, the great dam across American River, the head-gates and power-house, are all constructed from massive blocks of cut stone from these quarries. A new industry has been established near the prison, where a great quarry is being opened to furnish broken stone to be used in macadamizing roads throughout the State, under the direction of the State Bureau of Highways. At Folsom, 2 miles below the prison there has been installed an extensive electric plant, transmitting an abundance of current to Sacramento for power, lights, etc. (See special article.) A limited supply of natural gas has been obtained at Sacramento, with artesian water, but is not utilized. (See our XIIth Report and Bulletin No. 3, pp. 350 and 10–15.) The county is well watered both by stream and subterranean sources.

*Addison Mine* (Drift).—It is situated in the outskirts of Folsom, and covers a number of town lots. Mining privileges are leased to a number of Chinamen, who are sinking a shaft. Mr. Addison, of Folsom, owner.

*Blue Ravine Mine* (Drift).—It is 4 miles N.E. of Folsom, near Mormon Island. A shaft has been sunk 60′ to bedrock, and pay-gravel encountered. The power for hoisting and pumping is furnished by a threshing-machine engine. Hart Mining Co., owner; F. P. Jackson of Folsom, superintendent.

*Buckeye Flat Mine* (Placer).—It is on Buckeye Flat, 2½ miles S.W. of Folsom. D. Finch & Co., owner; P. O'Neil, of Folsom, superintendent.

*Donnelly Reservoir Mine* (Placer).—It is 2½ miles S.E. of Folsom, and is worked by a Chinese company. Ah Cum, of Folsom, superintendent.

*Eckhardt Mine* (Placer).—It is 3 miles S.E. of Folsom, and is worked by ground-sluicing. Chinese are employed. P. D. Eckhardt, of Folsom, owner.

*Folsom District.*—The mines in the vicinity of Folsom have been worked since the discovery of gold in California, and have yielded a large amount of gold. Since the inhibition of hydraulic mining the business is carried on in a small way by the ground-sluice and drift methods, more than 150 men being thus employed, of whom about one half are Chinese. In addition to the mines mentioned, there are a large number of wandering Chinese who go from place to place, with pan and rocker, working over old tailings and occasionally striking small areas of virgin ground. As these miners sell their gold to Chinese merchants, no information as to the amount obtained is available. Wells, Fargo & Co.'s agent at Folsom reports the shipment from his office at $12,000 to $20,000 per month. The estimate of the gold *not*

passing through the express office is placed at 20% of the total amount. There are many claims on the Natoma Grant, which are worked by lessees, who pay the company a stipulated price for the water, retaining whatever profit may be derived from mining operations. A number of claims are worked under this system by Portuguese.

*Folsom Water Power Co.'s Mine* (Placer).—See our Xth Report, p. 512. It is located in the bed of the American River, from the dam above the prison for a distance of 2 miles down the stream. It is said to be the intention of the company to divert all the water from the river at its lowest stage, through their canals, and then mine the river-bed. Folsom Water Power Co., of San Francisco, owner.

*Humbug Hill Mine* (Placer).—It is 1¼ miles S.E. of Folsom, and is worked by Chinese. Ah Chew, of Folsom, superintendent.

*Lake Shore Mine* (Drift).—It is on Rebel Hill, 3 miles S. of Folsom. There are four shafts, each 60′ deep. A 6′ pay stratum is being worked. The bedrock is volcanic ash (tufa). Both white men and Chinese are employed. M. H. Burke, of Folsom, owner and superintendent.

*Lawson & White Mine* (Drift).—It is 1 mile N.W. of Folsom, on Big Creek. Two prospecting drifts are being driven. Lawson & White, of Folsom, owners.

*Maben & Nickerson Mine* (Drift).—It is 2 miles S. of Folsom. A prospecting shaft is being sunk. Maben & Nickerson, of Folsom, owners.

*Mahoney & Keefe Mine* (Placer).—It is on Willow Spring Hill, 2 miles S. of Folsom; formerly a large hydraulic mine, it is now worked by ground-sluicing. Mahoney & Keefe, of Folsom, owners; Robert Keefe, of Folsom, superintendent.

*McCue Mine* (Drift).—See our XIIth Report, p. 227. It is a short distance below the town of Folsom, and about 60′ above the bed of American River. A shaft was sunk for the purpose of reaching the *true* bedrock, either granite or amphibole rock. The following strata were passed through:

| | |
|---|---|
| Cobblestones and gravel | 10′ |
| Tufa | 40′ |
| Gravel, containing some gold | 12′ |
| Tufa, coarse | 5′ |
| Gravel, gold-bearing | 0′3″ |
| Tufa, coarse | 6′ |
| Sand, fine-grained and colored dark green (probably volcanic mud) | 20′ |
| Gravel, containing iron sulphurets, but no gold | 6′ |
| Fossiliferous gray sand | 20′ |

Nothing has been done in this shaft for some time past, owing to the great volume of water encountered. Most of this water comes from the upper layers, and it is the intention to bulkhead this, and another attempt will then be made to reach bedrock. McCue & Bates, of Folsom, owners.

*Mendota Mine* (Placer).—It is in the bed of American River, a short distance below Folsom. A company has been organized to work the river-bed, but operations have not yet commenced. Mendota Gravel Mining Co., of Sacramento, owner.

*Michigan Bar Mines* (Hydraulic).—See our VIIIth Report, p. 556. They are situated at Michigan Bar, on the Cosumnes River, 12 miles N.W. of Ione. They have been worked many years. Interior Development Co., of San Francisco, owner. D. R. Thomas, of Michigan Bar, superintendent.

*Perry Mine* (Placer).—It is 3 miles S.E. of Folsom, and is worked by ground-sluicing. F. Perry & Co., owners; Frank Perry, of Folsom superintendent.

*Rebel Hill Mine* (Placer).—See our Xth Report, p. 510. It is on Rebel Hill, 3½ miles S. of Folsom, and worked by ground-sluicing. Perry & Rogers, of Folsom, owners; Frank Perry, of Folsom, superintendent.

*Rogers Mine* (Placer).—It is 2½ miles S.W. of Folsom. It is being supplied with new flumes, etc. Rogers & Co., of Folsom, owners; A. Rogers, of Folsom, superintendent.

*Rollins Mine* (Placer).—It is 3 miles S. of Folsom, and is worked by ground-sluicing. The bank is 20′ to 40′ high. R. J. Rollins, of Folsom, lessee and superintendent.

*Salvador Mine* (Placer).—It is 3 miles S. of Folsom. Salvador & Co., of Folsom, owners.

*Sulky Flat Mine* (Placer).—It is 1½ miles S.W. of Folsom. Worked by Chinese. Ah Cum, of Folsom, superintendent.

*White & Donnelly Mine* (Drift).—See our XIIth Report, p. 227. It is on the railroad company's right of way in the town of Folsom. The privilege of mining is leased to miners, who have sunk several 40′ shafts. Both white men and Chinese are employed. White & Donnelly, lessees; M. H. Black, of Folsom, superintendent.

*White, Donnelly & Cooney Mine* (Drift).—It is 2½ miles S.W. of Folsom, on the railroad company's right of way. Worked under lease. A prospect shaft is being sunk. White, Donnelly & Co., of Folsom, lessees.

*Willow Spring Hill Mine* (Placer).—It is 2 miles E. of Folsom, and is worked by ground-sluicing. Robert Keefe, of Folsom, owner and superintendent.

*Zimmerman Mine* (Quartz).—It is 5 miles S.E. of Folsom. It has a 30′ shaft, and is on patented land. Idle.

## San Benito County.

The principal industries are agriculture, fruit-growing, and stock-raising. The mineral industries, which are important sources of revenue, and promise well for the immediate future, are lime and quicksilver. Antimony, coal, chromic iron, copper, gold, gypsum, iron, manganese, and petroleum occur either in too limited quantities or too far from transportation for their profitable exploitation. The valley lands are abundantly supplied with water from streams, artesian and other wells.

*Chalone Mine.*—See our XIIth Report, p. 227. It is on a ridge near South Chalone Peak, 35 miles S.E. of Hollister, at about 2,200′ altitude, and is reached by trail from the mouth of Bear Valley. The development consists of a 500′ tunnel, run from the north side of the ridge, about 400′ below the summit. The country rock is a light-colored liparite in which traces of gold are said to exist, probably as a primary constituent. No important veins or especially disturbed zones occur, and the liparite becomes more compact and less ferruginous as the breast of the tunnel is approached. Idle. Thomas Flint, of Hollister, owner.

*San Justo Mine.*—It is in the San Juan Cañon, on the Flint ranch, 7 miles W. of Hollister, at about 400′ elevation. The country rock is gray

orphyry; the feldspar is somewhat decomposed, and numerous seams f iron pyrite strike in almost every direction. The pyritiferous ore is aid to assay $1 25 to $5 per ton in gold. The main tunnel has been riven 700′ northeasterly, from which a 100′ branch extends. The ore s said to become richer as the tunnel progresses. Two men are employed. homas Flint, Jr., of Hollister, owner.

## San Bernardino County.

The past two years has witnessed an increasing interest in mining ffairs in this county. A number of new mines have been discovered n the Mojave Desert region, and mills have been moved from old, noperative mines to newer ones. Several prospecting mills have been uilt for the purpose of testing properties, and a vast amount of pros- ecting done in both old and new districts. The silver and borax mines re worked regularly, and lime, granite, and marble quarries have eceived the usual attention. There are many latent resources in the ounty which will be developed when better or cheaper transportation acilities are afforded.

*Althea* (*Embody*) *Mine* (Quartz).—See our XIth Report, p. 361. It is t Oro Grande, at 2,800′ elevation. Idle. H. Eaton Estate, of Los ngeles, owner.

*Altuma Mine* (Quartz).—See our XIIth Report, p. 229. It is 15 miles E. of Bear Valley Lake and about 3 miles S. of the Rose Mine, at 8,000′ levation. The vein strikes N. 80° E., and dips 25° to 50° S., in a gran- te formation. The fissure is quite irregular in dip and has numerous ranches. The quartz is from 1″ to 2′ wide, often disappearing ltogether for considerable distances. There are three tunnels near the op of the hill, two of which are driven on the vein, and the other cross- utting to it. Considerable stoping has been done. Much of the develop- nent work has been performed in an erratic manner. About 125′ lower han the lowest of the above-mentioned tunnels a cross-cut tunnel has been driven 426′ into the mountain. At 286′ from the mouth a fissure vas passed through which, to all appearances, is the same as that above, ut the owners, evidently thinking otherwise, have driven the tunnel eyond. Drifts have been run 30′ each way from the cross-cut on this revice, but as neither the quartz nor gold was found, all work has been abandoned for the present. The mine is equipped with a 10-stamp team-power mill. Water is obtained from springs in Antelope Cañon. The pay-rock is delivered to the mill by means of an iron-pipe chute, about 700′ in length. The mill is 475′ vertically below the head of the chute. Altuma Mining and Milling Co., of San Bernardino, owner; G. E. Otis, of Redlands, president.

*Alvord Mines* (Quartz).—See our VIIIth and XIth Reports, pp. 499 and 359. This property is 23 miles N.E. of Daggett, and comprises six claims, the principal one being the *Royal*. Since our last Report con- siderable prospecting has been done, and a 5-stamp mill erected within 2 miles of the mines for the purpose of testing the ores. On the Royal Mine there are over 1,000′ of levels, and several hundred feet of winzes, cross-cuts, stopes, and open cuts. On the other claim the development consists of open cuts of various sizes. Idle. Alvord Mining Co., of Pasadena, owner; G. B. Senter, of Pasadena, agent.

*Bear Valley.*—See our XIIth Report, p. 229. No mining is being don in this valley, though there was considerable activity in Holcomb Valley 3 miles distant, the past year.

*Black Hawk Mines* (Quartz).—See our IXth, Xth, XIth, and XIIth Reports, pp. 226, 524, 364, and 230. They are 40 miles E. of Victor, a about 5,000′ elevation. Since our last Report the 10-stamp mill ha been removed to the Altuma Mine. Considerable sluicing of old dump has been done, which it is claimed paid well. The principal claims ar the *Lookout*, *Santa Fe*, and *Opera*. From the latter some high-grade or is being shipped. These mines seem to have possibilities, but have bee practically idle for some years. Cook & Leach, of Victor, owners.

*Blue Jacket Mine* (Quartz).—See Red Cloud.

*Boomerang Mine* (Quartz).—See our XIth and XIIth Reports, pp. 36 and 230. It is ½ mile S. of Vanderbilt, at 5,000′ elevation. There ar several shafts, the principal one being vertical and 550′ deep, an equipped with steam hoist. A 10-stamp steam-power mill is locate 3,000′ from the mine. Water is supplied from the mine. Prospectin work only is being done. A. G. Campbell, of Salt Lake, owner; Georg Nay, of Vanderbilt, superintendent.

*Brick Mine* (Quartz).—It is ½ mile S. of Vanderbilt, at 5,000′ eleva tion, and joins the Boomerang Mine. It has a 300′ tunnel and a 104 shaft. A. G. Campbell, of Salt Lake, owner.

*Burnap Mines* (Quartz).—See our XIIth Report, p. 231. They ar prospects, in Upper Holcomb Valley. J. Burnap, of Los Angeles, owner

*Carbonate Mine* (Quartz).—See our XIth and XIIth Reports, pp. 36 and 26. It is 1 mile E. of Oro Grande, at 3,000′ elevation. Althoug this mine produces chiefly a lead-silver ore containing some gold, ther is a shoot of high-grade gold rock in the west shaft, now 250′ deep which entitles it to a place among the gold mines. The rock is a mix ture of granular quartz and calcite, rich in gold. T. J. Fleming et al. of Los Angeles, owners.

*Center* (*Livingstone*) *Mine* (Quartz).—See our XIIth Report, p. 231 It is 17 miles E. of Bear Valley Lake. It was closed down early in July, 1895. Morongo King Mining Co., of San Bernardino, owner.

*Chippy Mine* (Quartz).—See our XIth and XIIth Reports, pp. 36 and 231. The mine was formerly worked by lessees, but has been idl during the past year. J. P. Taggart, of Los Angeles, owner.

*Christie Mine* (Quartz).—See our XIIth Report, p. 231. It is nea the head of Lone Valley, joining the Rose Mine on the west. The ore shoot discovered in the Rose Mine, near the surface, was found to pitch west into the Christie, as depth was attained. The developments con sist of a vertical shaft 190′ deep, with a 165′ cross-cut at the bottom t the ore-shoot, where drifts have been run E. and W., and a 50′ winz sunk. The workings connect with those of the Rose Mine. Pratt, Cul lom, et al., of Glendora, owners.

*Climax Mine* (Quartz).—It is in Surprise District, 3 miles W. of Bar stow, and near the line of the A. & P. R. R. The Climax is but one of a group of five claims. There are numerous other locations made, but their development is of the most superficial character. The Climax vein is 4″ to 10″ thick, strikes N.W., and dips S.E. A 60′ incline has been sunk. John M. Beckwith, of Calico, owner.

*Coupon Mine* (Quartz).—It is in Lone Valley, 45 miles E. of Victor, at 7,300′ elevation. It joins the Gem Mine on the north. A vertical

haft has been sunk 125′ to intersect the vein on its dip. Idle. Lizzie hristie, of Los Angeles, owner.

*Courtwright & McDonald Mines* (Quartz).—These are 15 miles S. of anby, on Old Woman's Mountain, at 3,000′ elevation. The principal ein is 1′ to 3′ wide, on which a 200′ tunnel has been driven, and a 100′ haft is now being sunk. There is no machinery on the mine. Courtright & McDonald, of Danby, owners.

*Coyote Holes.*—See our XIIth Report, p. 231. The gold discoveries ade here in 1894 did not prove as valuable as had at first been xpected, and the claims located at that time have been abandoned.

*Dry Lake District.*—It is 55 miles E. of Victor. Some prospecting is eing done there, but no mines of consequence are in active operation.

*Eastern Districts.*—In the eastern portion of this county are several istricts where mining is carried on in a more or less desultory manner. he ores are mostly of good grade, but the cost of water and fuel is usually ore than correspondingly high. The most prominent among these istricts are *Exchequer*, *Ibex*, *Ivanpah*, *Mescal*, *New York*, *Old Woman's Mountain*, *Providence Mountain*, and *Shadow Mountain*.

*Exchequer District.*—See our IXth Report, p. 223. It is 15 miles N. f Homer. Some prospecting has been done in this district within the ast two years, and some new claims located. No mines are in operaon at present. The lack of water is a serious drawback to claims hich are otherwise promising.

*Falcon Mines* (Quartz).—These constitute a group of seven claims in pper Holcomb Valley, at 7,800′ elevation. The principal claim is the *ucky Bill*, on which there are two veins: one 3′ wide, and one 6″ to 18″ ide. Two shafts have been sunk, 50′ to 100′ deep, respectively. A orse-whim has been put in place, and the work of development is to be ontinued. It is stated that a 5-stamp mill is soon to be erected. W. S. rnold et al., of Los Angeles, owners.

*Gem Mine* (Quartz).—It is in Lone Valley, 45 miles E. of Victor, and oins the Christie Mine on the north. It has a 4′x 7′ two-compartment haft, 90′ deep. There is no machinery on the mine. A. G. Watts, owner.

*Gladstone Mine* (Quartz).—See our XIth Report, p. 358. It is in Lava eds District, 35 miles E. of Daggett. Idle. W. Steadman et al., of aggett, owners.

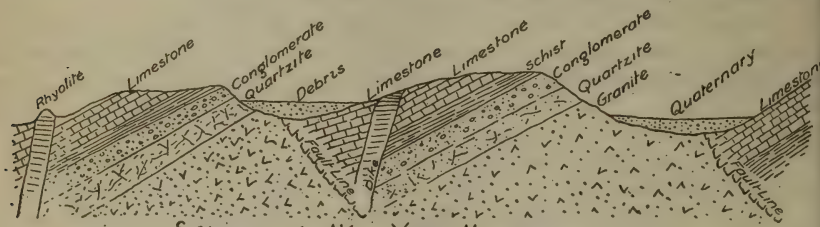
*Gold Bar Mine* (Quartz).—See our XIth and XIIth Reports, pp. 367 nd 231. It is at Vanderbilt, at 4,500′ elevation. See St. George.

*Gold Bar Extension Mine* (Quartz).—See St. George.

*Gold Bronze Mine* (Quartz).—See our XIth and XIIth Reports, pp. 67 and 232. It is at Vanderbilt, at 5,000′ elevation. The main shaft s 280′ deep. There is also an air-shaft, 100′ deep. The property has a team hoist and 10-stamp steam-power mill. The mine is idle, and in itigation. J. K. Patton et al., of Vanderbilt, owners.

*Gold Chief Mine* (Quartz).—This property, comprising a group of even claims, is situated 6 miles W. of Manvel, the present northern erminus of the Nevada Southern R. R., at 5,700′ elevation. The mines re at the extreme southwest end of the New York Mountains. The eology of the locality is simple, consisting of quartzites, in part conlomerate, mica schist, and limestones, resting on a mass of intrusive ranite. The quartzite forms the basal stratum of the sedimentary eries, and is the principal gold-bearing rock, though gold also occurs in he schists, and more sparingly in the conglomerates. The sedimentary

rocks have a curving strike around the granite core of the New York Mountains, and in this locality have an approximate dip at about 30 S.W. Dikes of rhyolite and felsite have intruded the sedimentary rocks and the topography of the region in the vicinity of the claims suggest the probability of faults. (See New York Mountains.) The *Gold Chief* is the principal claim, and has several hundred feet of development. A cross-cut tunnel has been driven through the granite to the quartzite and a 60′ winze sunk on the contact, which is found rolling. A drift 200′ long, follows along or near the contact from the foot of the winze and several diagonal cross-cuts have been made on the same level through the lowest stratum of quartzite into the conglomerate. Surface prospecting indicates that the underground workings have not penetrated all the gold-bearing formation. The quartzites, conglomerates, and schists are found to contain gold in many places across a zone of over 200′ in width. It is not claimed that all of this is pay-rock, but the present developments do not determine the possible extent and value of the gold bearing deposits. There is no machinery on the property, and water is



SECTION OF NEW YORK MOUNTAIN.

very scarce in the district. A well has been sunk in the wash near the mine, but no water obtained. Robert Young et al., of Manvel, owners.

*Golden Eagle Mine* (Quartz).—It is a prospect, 2½ miles S.W. of Vanderbilt. The quartz occurs in large vein-like masses in limestone, and contains much specular iron and some copper carbonate and gold. Charles Smithson, of Vanderbilt, owner.

*Golden Queen Mine* (Quartz).—It is in the Providence Mountains. See Hidden Hill.

*Gold Mountain Mines* (Quartz).—See our XIIth Report, p. 232. They comprise a group of claims 40 miles E. of Victor and 5 miles N.E. of Bear Valley Lake, at 7,800′ elevation. The property has a large amount of superficial development, in the form of open cuts. The gold occurs in quartzite, which lies like a cap on the summit of the hill. The underlying formation is granite and gneissoid rocks. E. J. Baldwin, of San Francisco, owner.

*Goldstone District.*—See our XIIth Report, p. 232. It is in the Providence Mountains, 30 miles N. of Fenner. The excitement created in 1894 by the finding of rich gold rock in that region appears to have subsided, and all the mines are idle.

*Gopher Mine* (Quartz).—It is a prospect, 2 miles N. of Vanderbilt, having only superficial development. A. A. Banning, of Vanderbilt, owner.

*Green Lead Mine* (Quartz).—It is 3 miles W. of Holcomb Valley, at 7,600′ elevation. After an idleness of years it is being reopened and a

Royal Rock Mine.

Steam Shovel at Holcomb Valley Mine.

tunnel run for further development. Richard Garvey, of San Gabriel, owner.

*Gulch Mines* (Quartz).—These claims, two in number, are in Jacoby Gulch, 35 miles E. of Victor and 1 mile S. of Cactus Flat, in Black Hawk District. A shaft has been sunk 30′ on a 3′ vein, which strikes N.W. and dips N.E. J. C. Johnson, of Victor, owner.

*Hidden Hill Mine* (Quartz).—It is on the eastern slope of Providence Mountains, 20 miles N. of Fenner Station, at 4,000′ elevation. The property comprises a group of five claims, of which the *Golden Queen* and *Hidden Hill* are the most important. The veins are small, 1″ to 8″ wide. The quartz is crystallized and some of it is rich in gold, containing also a small amount of chalcopyrite and iron oxide. The quartz of lower grade is crushed in a 2-stamp mill run by a gasoline-engine. The deepest workings are but 35′ from the surface. Monoghan & Murphy et al., of Needles, owners.

*Holcomb Valley District.*—See our Xth Report, p. 523. It is in the San Bernardino Mountains, 25 miles S.E. of Victor. Several quartz claims, which have long been idle, are being reopened, and it is now thought that, with the improved conditions, these mines may be made to pay. The Holcomb Valley Co. has done a vast amount of work during the past two years also. The gold-bearing quartzites of the district are again receiving attention.

*Holcomb Valley Co.'s (Limited) Mine* (Placer).—See our Xth and XIIth Reports, pp. 520–523, and 233. This company has been operating for several years past in Holcomb Valley and has expended a very large sum of money in prospecting, machinery, experiments, etc. A dredging machine (steam shovel) has been employed for three years past, but it has been found that the quantity of gold in the gravel is too small to make such extensive operations remunerative. Fully 3,000′ of trench, averaging 16′ wide and 8′ deep, has been excavated during the past two years with the shovel. Water for sluicing has to be pumped from wells; the amount of "stripping" required is usually large, and the grade of the valley insufficient to make mining on a large scale possible. A great many prospect shafts, 10′ to 40′ deep, have been sunk the past year, and at one point quite extensive drift-mining operations have been undertaken; the gravel being raised on an incline by steam-power and dumped into the bins, from which it is "fed" into sluices. A great deal has been said and written about the advisability of driving a long tunnel through the mountains on the north rim of the basin for the purpose of draining the valley and affording an outlet for tailings, etc.; but considering the small grade within the valley itself, this plan does not seem feasible. Holcomb Valley Co. (Ltd.), of London, owner; J. R. Thame, of Victor, superintendent.

*Holcomb Valley Mining Co.* (Quartz and Placer).—See our XIIth Report, p. 233. Their property is in Upper Holcomb Valley. The operations in progress here two years ago have been suspended, and all the mines are idle. Holcomb Valley Mining Co., of Los Angeles, owner.

*Hong Kong Mines* (Quartz).—These are 2 miles N. of Vanderbilt, at 4,000′ elevation, and include the *Gopher* and *Last Chance* claims. The deepest shaft is a 40′ incline. A. A. Banning, of Vanderbilt, owner.

*Ibex Mine* (Quartz).—See our XIth and XIIth Reports, pp. 368 and 233. It is 11 miles N. of The Needles and 3 miles E. of Marriner Station, on the A. & P. R. R. After a period of idleness in 1895, prospect-

ing was resumed in 1896, and some very encouraging developmer made. A 10-stamp, mill situated at the railroad, is connected with t property. Ibex Mining Co., of Los Angeles, owner; C. E. Marriner, Los Angeles, superintendent.

*Iron Mine* (Quartz).—It is ½ mile S. of Vanderbilt, at 5,000′ elevatic and is one of the claims in the *Boomerang* group. It has a 60′ vertic shaft. A. G. Campbell, of Salt Lake, owner; G. Nay, of Vanderbi superintendent.

*Irvington Mine* (Quartz).—It is 10 miles N.E. of Oro Grande, at 3,4 elevation. It is a new prospect, on which two 12′ shafts have been sui on a small vein in granite. J. R. Conser and J. D. Jones, of Victo owners.

*Ivanpah District.*—See our IXth and Xth Reports, pp. 238 and 5 It is 25 miles N. of Vanderbilt. The district became famous some yea since by reason of the discovery of high-grade silver ores. Gold pro pects have been found more recently, and prospectors are at wo developing some of the claims.

*Last Chance Mine* (Quartz).—See Hong Kong.

*Lava Beds District.*—See our IXth, Xth, and XIth Reports, pp. 224, 52 and 349. It is 36 miles E. of Daggett. Most of the mines are silver a copper producers, but gold claims are also located, though at prese idle.

*Little Lottie Mine* (Quartz).—It is a prospect 10 miles E. of O Grande, at 3,450′ elevation. A 12′ shaft has been sunk on a vein granite. Orin Staples, of Victor, owner.

*Lookout Mine* (Quartz).—It is one of the claims in the Black Haw District. See our IXth, Xth, XIth, and XIIth Reports, pp. 226, 523, 36 and 230. It has several hundred feet of tunnels and stopes, all in crushe limestone, which contains gold associated with hematite. Cook & Leac of Victor, owners.

*Lucky Bill Mine* (Quartz).—See Falcon.

*Lytle Creek Mines* (Placer).—See our XIIth Report, p. 233. The usu amount of placer-mining is done annually on this stream.

*McFarland's Mine* (Quartz).—It is 12 miles N.E. of Blake, in Exchequ District, at 3,500′ altitude. A shaft has been sunk 135′ on the vein, to 4′ wide, which is gold-bearing. It is claimed by the owner that th shoot was lost in sinking, and work was discontinued. Whether th vein pinched or faulted was not known; faults, however, are very com mon in other mines in this district. Water is very scarce in the distric This mine is idle. Wm. McFarland, of Vanderbilt, owner.

*Mescal District.*—See our Xth Report, p. 531. It is 20 miles N.W. Vanderbilt. After a long period of idleness, this district was again th scene of active prospecting the past year. The veins contain gold an copper.

*Monarch Mine* (Quartz).—It is near the old Oro Grande Mine, 7 mil N.W. of Oro Grande, at 4,150′ elevation. The vein is from 2″ to 2′ wid and has been opened by an incline 30′ deep. The vein strikes N.W and dips 30° N.E. It has no machinery, and is idle. Dr. Coliver et al of San Bernardino, owners.

*Morongo Mining Co.'s* (*Rose*) *Mine* (Quartz).—See our IXth and XIIt Reports, pp. 226 and 234. It is 45 miles N.E. of Victor, at 7,200′ eleva tion. The ore-shoots within the limits of the Rose claim are said t have been exhausted, the ore in its descent having pitched into th

Christie Mine, on the west. Admission to the mine and all information were refused, but judging from the condition of the mine at the time of a former inspection, there is no reason to discredit the above report. It is said that a cyanide plant of 50 tons daily capacity will be erected shortly, in connection with the Christie Mine. Morongo Mining and Milling Co., of Riverside, owner; K. D. Shugart, of Victor, superintendent.

*Morongo King* (*Center or Livingston*) *Mine* (Quartz).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 504, 226, 526, and 231. This property has been abandoned and the 10-stamp mill removed.

*Needles Reduction Works.*—They are on the bank of the Colorado River at Needles, and consist of crushing rolls, a system of elevators and conveyers, a Bryan mill, etc. It is a milling and not a reduction plant, and never was successfully operated. Owners unknown.

*New York Mountains.*—They are an extension of the Providence range, though disconnected. Veins and mineral deposits occur at several places in the sedimentary rocks which flank the main granitic core. The axis of the range is N.E. and S.W. The geology of the region is simple: The nuclear mass of the range is grano-diorite, which has uplifted the older sedimentary rocks on its flanks, the upper portion or dome of the great anticline having been eroded, leaving only the very rugged line of serrated peaks and ridges flanked on both sides and about the ends of the range by quartzites, limestone, mica schist, and conglomerates. On the eastern side are found numerous copper deposits in the limestone, the principal ore of which is chrysocolla. The silver ores of New York District also are found in the limestone, associated with low-grade copper ores. On the northeast end of the range, in low foothills, really independent of the main uplift in old crystalline schists, probably much older than the granite, are the fissure veins of the Vanderbilt District. North of the main range, in granite, which is a portion of the great mass of New York Mountains, are large quartz veins containing small amounts of gold and sulphide copper ores. On the west side and southwest end of the range gold is found in several places in the quartzite which forms the basal stratum of the sedimentary series. These quartzites are conglomerate in part, though the conglomerate is not at the base. They are found to be gold-bearing also, though of lower grade than the quartzites. The gold in the quartzites is evidently the result of impregnation, and was not deposited contemporaneously with the conglomerates. (See Gold Chief Mine.) A variety of eruptive rocks have intruded the sediments at many places, and local faults and folds are numerous.

*Nonpareil Mine* (Quartz).—It is 12 miles N.E. of Blake Station, in Exchequer District, at 3,500′ elevation. The ore contains both gold and copper. But little development work has been done. Cram & Miller, of Vanderbilt, owners.

*Old Dominion Mine* (Quartz).—It is in Exchequer District, 12 miles N.E. of Blake, at 3,500′ elevation. The vein strikes N.W., dips 45° N.E., and has a 30′ incline and several surface cuts. Cram & Miller, of Vanderbilt, owners.

*Old Woman's Mountain.*—See our IXth Report, p. 217. Veins of gold and silver ores and also silver-lead ore are found in this range. A group of claims is being worked at the north end of the range, 8 miles S.E. of Danby. See Winton Mines, also Courtright & McDonald Mine.

*Old Woman's Springs.*—See our XIIth Report, p. 234. The alleg discoveries of gold in the scoriaceous basalt at and near the springs ha been proved to have no foundation in fact. Some prospecting has be done in the vicinity in granitic rocks and limestone, and it is report gold has been found.

*Opera Mine* (Quartz).—It is in the Black Hawk District, 35 miles of Victor, at 6,500′ elevation. The mine is situated high up on th mountain side and can be reached only by a winding trail. Gold occu with hematite in bunches and veins in limestone. Since our last Repo considerable work has been done and a carload or more of high-gra ore shipped. The owner is engaged in getting out another carloa O. G. Leach, of Victor, owner.

*Ord District.*—See our IXth, Xth, and XIIth Reports, pp. 226, 52 and 234. It is in Ord Mountain, 14 miles S.E. of Daggett. Some deve opment work has been done on the gold veins of the district the pa two years.

*Oro del Fino Mine.*—It is at Vanderbilt. See St. George.

*Oro Grande District.*—See Silver Mountain District.

*Oro Grande Mine* (Quartz).—See our IXth Report, p. 227. It is miles N.E. of Oro Grande, at 4,100′ elevation. Some years since a lar amount of work was performed here on a vein, 1′ to 4′ in width. Th main incline is 200′ deep. At 100′ from the surface the vein is displace by a normal fault, the hanging-wall side having moved downward 3 or thereabouts. The vein was followed down to the fault plane, whe the miners, mistaking the fault for the vein, followed the former sou distance, but found the faulted vein in drifting, just below the fau line. All machinery has been removed and the mine is idle. Or Grande Mining Co., owner.

*Orphan Boy Mine* (Quartz).—It is in Exchequer District, 12 mil N.E. of Blake, at 3,500′ elevation. The ore contains gold and copper good grade. Its development is superficial. Cram & Miller, of Va derbilt, owners.

*Osborne Placers.*—See our XIIth Report, p. 234. They are in Upp Holcomb Valley, at 7,600′ elevation. Idle. J. B. Osborne, of Dagget owner.

*Pathfinder Mines* (Quartz).—They are 22 miles N. of Hinckley Statio and comprise a group of six claims on parallel veins, 600′ apart, strik ing E. and W., and dipping 40° S. There are four shafts, 20′ to 8 deep, and numerous small cuts. The veins are from 2′ to 3′ wid Y. R. Stevens, of Hinckley, owner.

*Providence Mountains District.*—See our IXth, Xth, and XIIth R ports, pp. 223, 519–532, and 235. It includes the Providence rang of mountains, and was at one time a field of active operations. Th Bonanza King Mine, which first gave the region fame, has been idle man years. More recently, discoveries of rich quartz rock have again attracte attention to the region. See Hidden Hill and Toughnut.

*Queen of Night Mine* (Quartz).—See our XIth and XIIth Reports, p 367 and 237. It is at Vanderbilt, at 5,000′ elevation. There are tw shafts, 75′ and 180′ deep respectively, and several open cuts on the vein The vein is from a few inches to 2′ thick, and in the ore-shoot is quit rich, considerable ore having been shipped. A cross-vein also is foun on the claim, upon which a cut and tunnel have been made, and som extremely rich quartz found. The ore is raised from the mine by mean of a horse-whim, sorted, sacked, and shipped to Eastern reductio

works. It contains gold, silver, lead, copper, iron, and zinc. The vein sends out numerous branches into the walls, which are coarsely crystallized gneissoid rocks, with dikes of pegmatite. J. K. Patton, of Vanderbilt, lessee.

*Red Cloud Mines* (Quartz).—These claims, including also the *Blue Jacket* and *White Cloud*, are on the west side of New York Mountains, 9 miles N.W. of Manvel. They are similar to the mines of the Gold Chief group (q. v.), but have little development. Robert Young et al., of Manvel, owners.

*Red Pencil Mine* (Quartz).—It is 10 miles E. of Oro Grande, at 3,450′ elevation. This claim and others near it were discovered in the spring of 1896, and considerable prospecting done. The Red Pencil vein strikes N. 80° W. and dips S. A shaft was sunk 27′ on the vein, which at the bottom is faulted. At 100′ distance a second shaft was sunk 40′ vertically, and developed nothing. Further prospecting will be done to discover the vein, if possible, below the fault. Orin Staples, of Victor, owner.

*Rose Mine* (Quartz).—See Morongo Mining Co.

*Royal Mine* (Quartz).—See Alvord.

*Royal Rock Mine* (Quartz).—It is 7 miles N.E. of Oro Grande, and about ½ mile E. of the Oro Grande Mine. An inclined shaft has been sunk 200′, at an angle of 35° to 45°. The rock formation is a massive chloritic rock, probably altered diorite, through which occur irregular masses, vein-like sheets, and veinlets of quartz containing auriferous iron sulphurets. The rock greatly resembles that of many mines in Calaveras and Amador counties. There are no selvages or well-defined walls, unless such should be found beyond the limits of the shaft. No cross-cutting has been done. It is the best-equipped shaft in this portion of the desert. Hunt & Alexander, of Oro Grande, owners.

*St. George Mines* (Quartz).—See our XIth and XIIth Reports, pp. 367 and 232–236. These mines constitute a group of claims at Vanderbilt, at 4,500′ elevation. These are the *Gold Bar*, *Gold Bar Extension*, and *Oro del Fino*, located on a single vein, which is opened at numerous places by cuts and trenches. There are five shafts, sunk at an angle of about 75°, which are 65′, 75′, 76′, 180′, and 300′ deep, respectively. The deepest shaft is equipped with steam hoist, the others with horse-whims or windlasses. There are several levels connecting the two deepest shafts. The vein is of the branching type, having the gneissoid rocks of the district usually on one wall and a light gray dike rock on the other. The dike sometimes forms both walls for some distance, or it may be found on the hanging or foot wall only. The tendency of the vein to form lenticular ore-bodies which overlap, with from 1′ to 10′ of heavy gouge (crushed country rock) between the lenses, is strongly marked. Considerable stoping has been done. It is now being worked under lease. The ore is hauled to the Boomerang mill, 1 mile distant. John W. Mackey et al., of New York, owners; A. G. Campbell, of Salt Lake, lessee.

*Santa Fe Mine* (Quartz).—It is one of the claims of the Black Hawk group, in which high-grade gold rock occurs, chiefly hematite with copper glance in limestone. Cook & Leach, of Victor, owners.

*Scoopendike Mine* (Quartz).—It is in Upper Holcomb Valley, at 7,000′ elevation. The vein strikes N.W., and dips 60° N.E. It is 4′ wide, with a 2′ streak of iron and copper sulphide, containing gold and silver. An 80′ incline has been sunk. H. Gates, of Victor, owner.

*Shadow Mountain District.*—In 1894 some rich gold quartz was di covered in Shadow Mountain District, 55 miles N.W. of Vanderbil The small size of the veins, some of which are faulted, the great distanc from supply points, and the scarcity of water, have retarded the develo ment of the mines, and the district is practically deserted.

*Silver Mountain District.*—See our IXth, Xth, XIth, and XIIth R ports, pp. 224, 527, 363, and 25. This district is more commonly know as the Oro Grande District, though organized as Silver Mountain Di trict. It embraces a large territory and includes gold, silver, and co per mines, and marble and granite quarries. There are several min in the district shipping lead-silver and "dry" gold ores.

*Sidewinder Mine* (Quartz).—See our IXth, Xth, and XIIth Report pp. 227, 527, and 235. It is in Silver Mountain District, 12 miles N.E. Oro Grande, at 4,500′ elevation. When the inclined shaft had reache a depth of 350′ all operations were temporarily suspended, pending th erection of a larger hoisting plant. Charles Weir et al., of Los Angele owners; J. Driskill, of Oro Grande, superintendent.

*Silver Reef District.*—See our XIth and XIIth Reports, pp. 365 an 377. It is 40 miles E. of Victor, and N.E. of the Black Hawk grou of mines. The mines on the "reef" are principally silver, but high grade gold rock has recently been found in the silver mines, and it i reported, also, to have been found about half way between Silver Ree and Old Woman's Springs, 2½ miles distant.

*Sunrise Mine* (Quartz).—It is in Ord Mountain District, and ha several hundred feet of drifts, winzes, and open cuts on the surface The vein occurs in a large diorite dike, along a zone much crushed an broken. The fissures are branching and numerous, and within this zon of crushing the mineralization has taken place. J. B. Osborne, of Dag gett, owner.

*Surplus Mine* (Quartz).—It is near the Rose Mine, at the head o Rattlesnake Cañon, at 7,000′ elevation. It has a 75′ vertical shaft. A G. Watts, of Victor, owner.

*Surprise District.*—It is 4 miles W. of Barstow, on the north side o the Mojave River. In 1895 some rich quartz rock was found in the dis trict and a large number of claims located, on many of which superficia development work has been done. The veins are mostly small, 2″ to 10′ wide, and in some of them the rock is high-grade, showing gold. Th formation is a coarsely crystallized gneissoid rock, in which hornblend and feldspar are prominent, the latter being much kaolinized and th hornblende mostly altered to chlorite, epidote, etc. Large dikes o quartz-porphyry traverse the country in a N.W. direction. Granulit also occurs in an immense dike. These intrusive dikes appear to hav no direct relation to the gold-bearing veins. The veins are fissure striking N.W., and dipping 20° to 90° N.E. The gold occurs in quart and a purplish-brown iron ore, derived from the oxidation of pyrite Some of the deposits contain considerable copper, sulphide, and car bonate. Limestone is found on the northern border of the gold region Four miles northwest, galena and lead carbonate, with silver, and also some rich chloride of silver ore, are found. See Climax Mine.

*Swarthout Mine* (Quartz).— It is in Badger Cañon, 7 miles N. of the City of San Bernardino, at 3,000′ altitude. A tunnel has been driven 300′ on a vein that dips at an angle of 15° into the mountain, in gneissoid granite. Swarthout Bros., of San Bernardino, owners.

*Toughnut Mine* (Quartz).—It is in the Providence Mountains, 30 miles . of Fenner, and 2 miles from the Bonanza King Mine, at 3,800′ elevaon. The vein is small and strikes N.E.; it is vertical. The mine has 60′ shaft and superficial workings. Charles A. Stilson et al., of Los ngeles, owners.

*Valencia Hill Mines* (Quartz).—They are in Holcomb Valley District, 5 miles E. of Victor, and 1½ miles W. of Gold Mountain. The gold ccurs here in quartzite similar to that at Gold Mountain. The massive uartzite is found crushed in broad zones, the main fractures of which re parallel, or nearly so, and which sometimes conform to the bedding lanes. The harder, more massive rock is found to contain pyrite, and s also gold-bearing. The past summer considerable exploration work as being done, and a 5-stamp mill erected for the purpose of thorughly testing the mines. The quartzite of this district is undoubtedly f the same geological age as that at Oro Grande and at the southwest nd of New York Mountains; in the Gold Chief Mine, and at other localies in this county. The quartzite has been found to be gold-bearing n several localities. S. Baird, of Victor, owner.

*Vanderbilt District.*—See our XIth and XIIth Reports, pp. 367 and 35. It is 4 miles N.E. of Manvel, the northern terminus of the Nevada outhern R. R., at about 5,000′ elevation. The principal mines in the istrict are the *Boomerang*, *Gold Bronze*, *St. George Group*, and *Queen of Night* (q. v.). The activity which formerly characterized mining operaons in this district is now lacking, but few of the mines are being orked, and the population has greatly decreased. All the mines of the istrict that are in operation are in the hands of lessees, with the single xception of the Boomerang.

*Webster Mine* (Quartz).—See our XIIth Report, p. 237. It is at anderbilt, and forms a part of the Boomerang vein system, being an ffshoot of the latter. The vein strikes N. 85° E. and dips 45° N., and hough it is small has been one of the best-paying veins of the district. t has been quite extensively worked by lessees, who have taken out uite a large amount of high-grade ore, most of which has been shipped o Eastern reduction works. A. G. Campbell, of Salt Lake, owner.

*Whatnot Mine* (Quartz).—See our IXth Report, p. 228. It is 7 miles .E. of Oro Grande, at 4,000′ elevation. The vein strikes N. and S. and ips nearly vertically. An adit has been run 300′ on the vein, connected t two points with the surface by upraises. Considerable stoping has een done above the level. A winze has been sunk 125′ in the tunnel nd at 100′ depth a level run, from which stopes have been carried up 40′ r more. The vein is 6″ to 12″ wide, but produces high-grade rock, hich is shipped. H. P. Lemmert, of Los Angeles, owner; Morgan & eith, of Oro Grande, lessees.

*Winton Mines* (Quartz).—They are on the north end of Old Woman's ountain, 7 miles S.E. of Danby, at 4,000′ elevation. There are thirteen laims in the group, only one of which has any development. The vein s in granite, strikes E. and W., and dips vertically. A cross-cut tunnel as been driven to the vein and a level opened along it, connecting with n upraise to the surface. The total workings do not exceed 150′. There re also several surface cuts on the vein, which is 1″ to 10″ wide. The uartz is packed down the mountain on burros to the mill, 1,000′ below. he mill has 2 stamps of 850 lbs. each, with discharge openings on hree sides. Power is furnished by a gas-engine. Water is obtained rom springs in a neighboring cañon. E. Kennedy, of Pasadena, owner.

## MILLS IN SAN BERNARDINO COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Altuma | Steam | 10 | 850 | | | | | | | |
| Alvord | | 5 | 850 | | | | | | | |
| Barbero | Steam | 10 | 900 | 30 | | | | | | |
| Bonanza King | | 10 | | | | | | | | |
| Boomerang | | 10 | 850 | 15–20 | | | | | | |
| Falcon (will build 5-stamp mill) | | | | | | | | | | |
| Gold Bronze | | 10 | 750 | 10 | (Bumping Tables.) | | | | | |
| Hawley | Steam | 10 | 700 | 25 | | | | | | |
| Hidden Hill | Gas | 2 | 850 | 3 | | | | | | |
| Ibex | | 10 | 850 | | | | | | | |
| Ivanpah | | 10 | | | | | | | | |
| Langtry | | 5 | 850 | | | | | | | |
| Oriental | Steam | 30 | 850 | 90 | (Boss process of amalgamation.) | | | | | |
| Oro Grande | Water | 10 | | | | | | | | |
| Rose | Steam | 5 | 850 | 12 | | | | | | |
| Silver King | Steam | 30 | | | (Boss process of amalgamation.) | | | | | |
| Valencia Hill | | 5 | 850 | | | | | | | |
| Waterloo | Steam | 15 | 850 | | (Boss process of amalgamation.) | | | | | |
| | Steam | 60 | 850 | | (Boss process of amalgamation.) | | | | | |
| Winton | Gaso. | 2 | 850 | 3 | | | | | | |

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SAN BERNARDINO COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Plant, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Cal. Portland Cement Works | | 4 | Griffin | | 150 | | | | | | |
| Needles Reduction Works | | | Bryan | | | | | | | | |

## San Diego County.

This county has shared liberally in the increasing interest in mining affairs within the past two years. A large portion of the county consists of desert, but in nearly every hill and range rising above the barren, sandy plains are found veins and ore-deposits, some of which are phenomenally rich in gold. The Golden Cross Company owns a large tract of mineral land in the Cargo Muchacho Mountains, and since our last Report have added a 100-stamp mill to their already large plant. This property, situated in the Colorado Desert, has attracted much attention from outside the State, and in the vicinity a number of new enterprises have been inaugurated. Encouraging results have been obtained in the Picacho District, 30 miles north of Fort Yuma, on the Colorado River. In that portion of the desert lying north and east of the S. P. R. R. numerous prospectors are scouring the mountains in search of new veins, or working on those already discovered. The Julian District and the various mining fields along the Cuyamaca range continue to add to the output of gold. In the vicinity of Escondido there has been considerable prospecting done on large deposits of mineralized rock. The valleys of this county, which lie between Cuyamaca range and the ocean, are picturesque and of unsurpassed fertility, and horticulture is of much importance. The region along the coast enjoys the reputation of having the most phenomenally equable climate in the State.

*Able Mine* (Quartz).—It is a new prospect in Crescent Valley, 7 miles S.W. of Escondido, at 400′ elevation. It occurs as a segregated vein in a mass of shattered and crushed diorite. There are two shafts, 25′ and 35′ deep respectively. S. P. Able, of Escondido, owner.

*Albert Polhamus Mine* (Quartz).—See White Gold Basin.

*Alcyon Mine* (Quartz).—See White Gold Basin.

*Alfonso Mine* (Quartz).—See White Gold Basin.

*American Girl Mine* (Quartz).—It is in the Cargo Muchacho Mountains, 23 miles N.W. of Yuma, and is a new prospect, in which a 200′ incline has been sunk and several levels run. Some good quartz has been encountered. Johnson & Lohman, of Hedges, owners.

*Antelope Mine* (Quartz).—See our XIth and XIIth Reports, pp. 380 and 238. It is 1½ miles N.W. of Banner, at 3,500′ elevation. The main tunnel is 420′ long. The 100′ shaft is now caved. A small force of men is at work. Bailey Bros., of Banner, owners.

*Apache Mine* (Quartz).—See Picacho.

*Artery Consolidated Mines* (Quartz).—This group, comprising three claims, is 2 miles S. of Dulzura, at 1,300′ elevation. The gold-bearing quartz is found in a large felsitic mass along a zone of crushing. The main tunnel is 400′ long. A cross-cut tunnel has been driven 45′ and several shafts, 15′ to 30′ in depth, sunk along the lode. An arrastra has been built, and will be run by a gas-engine. Stuart Donohue, of Dulzura, owner.

*Banner Mines* (Quartz).—This property comprises a group of claims at and near Hedges, 25 miles N.W. of Yuma. The principal claims are the *Nana* and *Overlook*. On the former a 110′ shaft was sunk and abandoned. The Overlook lies at 500′ elevation, and a vertical shaft, now 285′ deep, is being sunk. It is stated that it is the intention to sink to the *Golden Queen* shoot of the Golden Cross Company, which is pre-

sumed to pass under the surface of the Overlook ground, and in th event of finding it within the lines of the latter claim the Banner Com pany will contest the extra-lateral rights of the Golden Cross Company basing their idea on the theory that these ore-deposits (if they may b called such) belong to a class known as bedded deposits, and not veins Banner Mining Co., of Denver, Colo., owner; H. B. Adsit, of Hedges superintendent.

*Bay View Mine* (Quartz).—See our XIIth Report, p. 238. See Nobl Group.

*Bertha Mine* (Quartz).—It is 12 miles E. of Banner, in Rice District at 3,800′ elevation. A shaft has been sunk 25′ and a tunnel driven 7 on the vein. The vein is large and well defined, and is apparently on th same fissure as the N. G. Mine. Rice Bros., of Warner, owners.

*Beyers Mines* (Quartz).—They are near Deer Park, 9 miles N.E. o Descanso, at 4,500′ elevation. They are named the *Cascade*, *Combina tion*, *Corporal*, *Hermit*, *Matamore*, and *Spike*. Each of them has som superficial development. A water-power arrastra was built some year ago, since which time a 2-stamp water-power mill has been erected Idle. John Y. Beyers, of Descanso, owner.

*Black Eagle Mine* (Quartz).—See our XIth and XIIth Reports, pp 382 and 238. It is at Mesa Grande, 1 mile N. of Rancheria. A 20′ shaf and some superficial workings are the only developments. When firs discovered this quartz was very rich in gold. Hinckle & Co., of San Diego, owners.

*Bloodstone Mine* (Quartz).—It is a prospect 4½ miles E. of Escondido at 1,200′ elevation. It has a 25′ vertical shaft. H. C. Brown et al., o Escondido, owners.

*Blossom Mine* (Quartz).—See our XIIth Report, p. 238. It is 20 mile N.W. of Yuma, in the Cargo Muchacho Mountains, at 400′ elevation It has a 280′ incline sunk on a mass of chloritic rock, altered from coarse granular diorite. It contains a small percentage of iron sul phuret. A 10-stamp mill has been built to crush this rock. Idle Blossom Gold Mining Co., of Los Angeles, owner.

*Bobtail Mine* (Quartz).—See Noble's.

*Bonnie Belle Mine* (Quartz).—It is 12 miles E. of Banner, in Rice District, at 3,700′ elevation. The vein is from 2′ to 10′ wide, and occurs in a series of swells. A 15′ shaft and several superficial cuts have been made on the vein, which strikes E., and dips 80° N. Chatam Helm et al., of Warner, owners.

*Bottle Peak Mine* (Quartz).—It is 4 miles E. of Escondido, at 1,670 elevation. The vein strikes N.E., and dips 32° N.W. It is apparently a continuation of the fissure system of the old Escondido Mine. The vein, 2″ to 20″ wide, occurs in grano-diorite. An incline has been sunk 55′, which exposes a somewhat irregular "splicing" or overlapping vein, accompanied by a much decayed, dark-colored rock, evidently diorite. W. P. Bevington, of Escondido, owner.

*Buena Vista Mine* (Quartz).—It is near the Colorado River, 30 miles above Yuma. Several shafts and cuts have been made on the vein and levels run at various points. The deepest workings are about 200′ from the surface. After an idleness of many years, work was resumed the past summer.

*Cable Mine* (Quartz).—It has been consolidated with the old *Fraction* and *Treasury* claims, and is ¾ mile N.W. of Banner, at about 3,300′

levation. The principal development is on three adit levels, which are 17′, 160′, and 330′ long respectively, the last being the lowest. Considerable stoping was done in the upper levels years ago, and it was to each the shoot that the lowest tunnel was driven, which has already encountered two separate shoots. The quartz is similar to that found in the other mines of this district, a granular, rather glassy rock, with some disseminated pyrite, and often rich in gold. Venturina Mining Co., of San Diego, owner; A. P. Frary, of Banner, superintendent.

*California Picacho Mine* (Placer-Hydraulic).—See our XIIth Report, p. 238. It is 60 miles by river above Yuma and 27 miles N. from Fort Yuma, in Picacho Basin. The expensive pumping plant is located within a few yards of the Colorado River. The mines are situated 500′ higher, and 4 to 5 miles back from the river. The pumps proved inefficient. The reservoir from which it was expected to derive pressure is simply a wooden tank holding about 3,000 gals., and giving 50′ to 75′ pressure. The sluice grade is light, being about 100′ per mile. The primary cause of the trouble seems to have been the inefficiency of the pumping machinery and a lack of practical knowledge on the part of the management. A score of Mexicans are at work almost the year round, with dry-washers, in the gulches of the district.

*Cargo Muchacho District.*—It is 15 to 22 miles N.W. of Yuma; the nearest railroad station being Ogilby, on the Southern Pacific. The entire range consists of highly silicious metamorphic rocks, some of which may be of eruptive origin; notably a grayish-green, granular diorite at Hedges. These rocks throughout the range are intruded by a network of pegmatite dikes of irregular shape and size, some of which are gold-bearing; notably in the Golden Cross and Cargo Muchacho mines. The mountain range is divided into two distinct and separate portions, though having their axes in a common direction; that is, N.W. and S.E. A broad cañon separates the two portions of this range. The southeast portion of the range is made up of rather coarse-grained, grayish-green, crystalline rocks. These are intruded by diorite dikes, and at one place is found a large zone of schist, in which cyanite (an aluminous silicate of sky-blue color) occurs abundantly. Most of this portion of the mountain range seems to be metamorphic eruptive rocks, including also rocks of sedimentary origin, quartzite, mica-schist, etc. The northwest portion of the range consists chiefly of hornblende-schist, mica-schist, and massive diorite; the whole mountain mass being a network of the coarse-grained granite veins above referred to. In the latter range is found the immense gold-bearing bedded and similar deposits of the Golden Cross system. The dip of the strata is S.W., and to this the gold-bearing masses conform. This dip would indicate that the rocks of the region above Hedges, in the Golden Cross mines, would dip beneath the region forming the southerly portion of the range. It is not evident whether the plainly marked division between the two sections of the range is the result of a fault and displacement or not. The rocks of the region about the Cargo Muchacho Mine, south of the cañon, disintegrate more rapidly, apparently, than the harder-grained rocks about Hedges. The veins of the southern section are mostly fissures filled with quartz and sulphide minerals, containing gold. Faults and displacements are of frequent occurrence in both groups of hills.

*Cargo Muchacho Mine* (Quartz).—See our VIth (Part I), XIth, an XIIth Reports, pp. 81, 385, and 239. It is 4 miles from Ogilby and 1 miles N.W. of Yuma. Idle past two years. Paymaster Mining Co of Yuma, owner.

*Cascade Mine* (Quartz).—See Beyers.

*Chaparral Mine* (Quartz).—See our XIIth Report, p. 239. It is 2 miles S.E. of Julian. W. W. Boswell, of San Diego, owner.

*Chief of the Hills Mine* (Quartz).—See our XIth and XIIth Reports pp. 382 and 239. It is in Dulzura District, 30 miles E. of San Diego M. O'Reilly, of San Diego, owner.

*Cincinnati Belle Mine* (Quartz).—See our XIth and XIIth Reports, pp 380 and 239. It is 1 mile N.W. of Banner, at 3,500′ elevation. The ver tical shaft is now 230′ deep, and supplied with a steam hoisting plant Banner Gold Mining Co., owner; Horace Crinklaw, of Banner, superin tendent.

*Clark Mine* (Quartz).—It is 9 miles N.E. of Descanso, at 4,000′ elevation There is quite a large amount of superficial development, and a good grade of rock is extracted, which is reduced in a water-power arrastra — Clark, of Descanso, owner.

*Clifton Mine* (Quartz).—It is 9 miles S.W. of Escondido, at 400′ eleva tion, and comprises a tract of 80 acres. The deposits or ore-shoots occu in the broad zones of crushed felsite. It is heavily mineralized and stained with iron oxides. Several open cuts and short tunnels have been driven into the hill. The ore-shoots strike N. 15° W., and dip 80° N.E. The formation in the vicinity is grano-diorite, giving place to a large eruptive formation nearly a mile wide, consisting of felsite and felsitic breccia, the fragments of which are found to become larger going eastward. These rocks continue to the Bernardo River, when a gray diorite succeeds it. Q. R. Smith et al., of Santa Ana, owners.

*Combination Mine* (Quartz).—See Beyers.

*Comet Mine* (Quartz).—It is 2 miles S. of Dulzura, at 1,600′ elevation. It has several short tunnels and surface cuts. Idle. S. H. Donohoe of Dulzura, owner.

*Corporal Mine* (Quartz).—See Beyers.

*Coyote Mine* (Quartz).—It is 7 miles S.W. of Escondido, at 1,100′ elevation. Here is found a series of mineralized shoots having a common N.W. strike, in a light gray diorite. The workings consist of a 60′ tunnel and several surface cuts. H. W. Roff et al., of Escondido, owners.

*Cravath Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 524, 382, and 239. It is 2 miles S.E. of Escondido, on the old Escondido lead. Idle. Gus Cravath, of Escondido, owner.

*Crescent Mine* (Quartz).—It is a prospect in Crescent Valley, 3 miles S.W. of Escondido, at 600′ elevation. A 65′ vertical shaft has been sunk. Ranford Worthing, of Escondido, owner.

*Deer Park District.*—This is situated above Pine Valley, about 10 miles E. of Descanso. There are a number of claims in the district on which superficial work has been done. The quartz veins are well defined on the surface, though of low grade. The formation is granite and gneissoid rocks. There is an arrastra and a 2-stamp mill in the district, both of which are idle.

*Deer Park Mine* (Quartz).—It is in Deer Park, 10 miles E. of Descanso, at 4,400′ elevation. A small cut was made on an 18″ vein, which strikes N.W. and dips N.E. A 50′ vertical shaft was then sunk in the

anging-wall, but no vein encountered, furnishing another example of he advisability of "staying with the vein," when prospecting. G. Colr Robbins, of San Diego, owner.

*Double Standard Mine* (Quartz).—See Hawkes.

*Dulciana Mine* (Quartz).—It is 25 miles N. of Yuma, in Picacho asin, at 700′ elevation. It has two shafts, 75′ and 80′ deep respectively. t is on one of the gold-bearing zones peculiar to this district, consisting f a mass of crushed rock, probably diorite, now schistose and largely hloritic. Quartz occurs only as disseminated grains (an original conituent of the rock), vein-quartz not appearing in the deposit at all. he walls are only defined by the limit of the pay zone. S. W. Dorsey, f Denver, owner.

*Dulzura District.*—See our XIth Report, p. 382. It is 30 miles E. and little S. of San Diego. The ore-deposits occur in felsite along zones of recciated and crushed rock. The quartz is low-grade for the most part, hough sometimes rich streaks are found. The region seems to have een unfortunate in its metallurgical experiments. There is a 5-stamp ill, of unheard-of pattern, and a roller mill on the Oneida Mine; either of which ever obtained satisfactory results, being placed there y the inventors for the purpose of experiment. An arrastra, run by a asoline-engine, is now doing good work on one of the claims.

*Duncan Mine* (Quartz).—It is 15 miles N.E. of Yuma, at Pot Holes. he vein strikes N.W. A 150′ shaft has been sunk on the foot-wall, at 0° inclination. The width of the vein is unknown, as the whole excaation is in quartz and vein material. R. J. Duncan, of Yuma, owner; E. A. Wetmore, of Yuma, superintendent.

*Eagle Mine* (Quartz).—It is a prospect, ¼ mile S.E. of Julian, at 4,200′ levation. It has only superficial development. A. P. Frary, of Banner, owner.

*Eastern California Mine* (Quartz).—It is in Picacho Basin, 25 miles N. of Yuma, and is similar to the Dulciana. It has a 50′ shaft. Further development work is now in progress. S. W. Dorsey, of Denver, wner.

*East End Mine* (Quartz).—See Noble's.

*Elevado Mine* (Quartz).—It is 1½ miles S. of Banner, at 3,300′ elevaion. This is a new mine, opened within the past two years. The vein trikes N.W., and dips 60° S.W. The shaft is 160′ deep; two levels ave been run at depths of 50′ and 100′ respectively, which expose a ein 2′ to 8′ wide. Within this zone are one, two, and sometimes three quartz veins, carrying gold. The quartz is very fine in grain, considerbly stained with iron and manganese oxides, and is crushed throughout nto small pieces, being found pulverized in many places. There is very indication of movement and pressure in these levels. A fault has displaced the vein on the 100′ level, and prospecting below that point s in progress for the purpose of discovering the downward continuation of the vein. C. F. Hall et al., of San Diego, owners.

*Ella Mine* (Quartz).—See our VIth (Part I) and XIIth Reports, pp. 85 and 239. It is 1½ miles S.E. of Julian, at 3,600′ elevation. Estate of S. N. Wilcox, of Julian, owner; E. A. Stanley, of Banner, lessee.

*Escondido District.*—Within the past two years there has been a marked interest in mining in the hills surrounding the valley of Escondido. The most extravagant reports as to the extent and richness of the mines were published. A careful investigation of the region was

made, with the following result: Grano-diorite, passing over in som localities on the western border of the region into gray diorite, form the main rock-mass over a large territory. On the east grano-diorit predominates, and to the northward of Escondido mica-schist is found Throughout this area of nearly 200 square miles are found intrusiv dikes and masses of eruptive rock. These rocks are grayish-green, dark green, and black diorite, felsite, felstone, felsitic breccias, and pegmatit The so-called phonotite of the region is a dark-gray felsitic rock and black diorite-ophanite. These dikes are from 3′ to over 100′ in widtl branching and irregular, having the characteristic tendencies of eruptive generally. Certain portions of these dike-masses have been crushe along planes, usually striking in a northerly and southerly direction and into these crushed zones have infiltrated silica and sulphide mineral The oxidation of the latter has produced the red, brown, and yello colors in these rocks, which forms such a prominent feature of the out crops. In a score of places, cuts, shafts, and tunnels have been mad for the purpose of exploring the deposits. To determine the characte of the so-called ore from this district, samples were selected from thre of the principal claims. The rock was pulverized and a portion care fully panned, to ascertain whether or not it contained free gold. Non was obtained. The remainder of the three samples was then submitte to L. Falkenau, formerly State Assayer, with instruction to use th utmost care. Four tests were made of each sample, with the followin result:

No. 1. *Geneva Mine*...Silver, trace; Gold, 0.006 oz., or about 12 cents per ton.
No. 2. *Moe Mine*.....Silver, trace; Gold, trace.
No. 3. *Granite vein*.....Silver, trace; Gold, trace.

*Escondido Mine* (Quartz).—See our VIIIth, IXth, and XIIth Reports pp. 524, 382, and 240. It is 2 miles S. of Escondido, and has been idl since our last Report. Escondido Land and Town Co., of Escondido owner.

*Eureka Mine* (Quartz).—See Noble Group. It has a 300′ tunnel and an incline 100′ deep.

*Fraction Mine* (Quartz).—See Cable.

*Free Coinage Mine* (Quartz).—See Hawkes.

*Geneva Mine* (Quartz).—It is 3 miles E. of Escondido, at 1,000′ eleva tion. It is the principal claim of the newly discovered mines of the local ity. The geology in the vicinity of the mine is very simple. The formation is grano-diorite, into which has been intruded a dike of felsitic rock about 100′ thick, which strikes N.E., and is found to split into two branches going northward. The rock is very silicious, fine-granular in texture, and has been improperly called quartzite. It is much shattered and crushed and is impregnated throughout with finely divided iron sulphide. The upper portion is stained throughout with iron oxides The dike dips 30° to 40° S.E. A 75′ vertical shaft was sunk near the western edge of the rock-mass, passing through a portion of the dike and into the foot-wall. A second shaft was sunk in the hanging-wall granite; a third, 30′ deep, was sunk on the vein, and several superficial cuts made. It is claimed by the owners that the rock is all gold-bearing, but that it is not free, the idea being that the gold is in combination with the sulphide minerals. Were this the fact it would be reasonable to expect to find "free gold" in the oxidized zone, but this is not the case.

Most of the claims in this region are almost identical geologically, the exceptions being the formation of "ore-shoots" in crushed zones of diorite. The mines are all similar, in that they do not show gold with the pan or horn. If, as is claimed by the owners, the gold occurs associated with the pyrite only, it resolves itself into a simple concentrating proposition, with the subsequent treatment by chlorination or some other process. Geneva Mining Co., of Santa Ana, owner; H. C. Brown, of Escondido, manager.

*Gold Chain Mine* (Quartz).—It is in White Gold Basin, 30 miles N. of Yuma, and is a claim of the Swain group. A cut 20'x30' has been made on a large mineralized zone. See White Gold Basin. W. Swain, of Picacho, owner.

*Gold Cliff Mine* (Quartz).—It is at Mesa Grande, near the Shenandoah. It has only superficial development.

*Gold Crown Mine* (Quartz).—See White Gold Basin.

*Gold Hill Mine* (Quartz).—See White Gold Basin.

*Gold King Mine* (Quartz).—See our VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 513, 143, 543, 381, and 241. It is 4 miles S.W. of Banner, at 400' elevation. It has a shaft with several levels. Idle. The mill is situated at Banner, 11 miles distant by road. The same mill is used to crush ore from the Cincinnati Belle and Gold Queen, an adjoining mine. Banner Gold Mining Co., of Pomona, Los Angeles County, owner.

*Gold King Mine* (Quartz).—It is 30 miles N. of Yuma, near White Gold Basin. A 50' vertical shaft has been sunk on a mineralized zone in diorite. W. Swain, of Picacho, owner.

*Gold Prince Mine* (Quartz).—It is a prospect 30 miles N. of Yuma. See White Gold Basin. W. Swain, of Picacho, owner.

*Gold Princess Mine* (Quartz).—It is a prospect 30 miles N. of Yuma. See White Gold Basin. W. Swain, of Picacho, owner.

*Gold Queen Mine* (Quartz).—It is a prospect 30 miles N. of Yuma. See White Gold Basin. W. Swain, of Picacho, owner.

*Gold Queen Mine* (Quartz).—It is 4 miles S.W. of Banner, at 4,000' elevation. A 100' shaft has been sunk on a vein in granite. See Gold King. Banner Gold Mining Co., of Pomona, Los Angeles County, owner.

*Gold Rock Mines* (Quartz).—See Golden Cross.

*Gold Rule Mine* (Quartz).—See Jaeger.

*Golden Chariot Mine* (Quartz).—It is 4 miles S.E. of Banner. See our VIth (Part I) and IXth Reports, pp. 86 and 147. Pacific Bank, of San Francisco, owner.

*Golden Casket Mine* (Quartz).—See Picacho.

*Golden Crescent Mine* (Quartz).—It is 3 miles S.W. of Escondido, near Crescent Valley. The claim is located on a large mass of granulite, much crushed and iron-stained, and the feldspar kaolinized. The workings are superficial. J. B. Carrol et al., of Escondido, owners.

*Golden Cross Mines* (Quartz).—See our XIIth Report, p. 240. They are in Cargo Muchacho Mountains, at Hedges, 25 miles N.W. of Yuma and 6 miles by road N.E. of Ogilby. Since our last Report these mines, which comprise a large group of claims, have been opened quite extensively. The principal claims are the *Golden Cross*, *Golden Crown*, and *Golden Queen*. The deepest workings are in the last, being 550' on the 40° incline. The Golden Cross and Golden Crown are 250' and 350' deep respectively. The more recent development of these mines has thrown

some new light on the peculiar formation. The masses of rock, which ar found to be gold-bearing, are chiefly micaceous and hornblende schist usually very silicious. The ore-shoots are variable in size. That in th Golden Cross is 70′ thick at one place, and in the Golden Crown ther is a 20′ stope. The workings of the Golden Queen are more extensiv than either of the former, and lie in a different, though parallel, zon It has been found that the foot-wall side is usually better defined tha the hanging-wall, and is more regular. The gold-bearing zones ar not clearly defined at all places. They occur as a series of "swells making up into the hanging-wall side, being usually thickest at th center and thinning out at the sides. It is sometimes, though no always, possible to distinguish pay-rock from that which is barren, b the physical appearance. Among the usual occurrences of gold in thes mines may be mentioned the finding of gold in masses of hornblend without visible free quartz; in an aggregation of biotite scales; in peg matite (dike rock); and frequently in a highly silicious rock containin much epidote, and often garnets. Since our last Report a new 100-stam mill has been built some distance above the old 40-stamp mill. Th stamps of the new mill weigh 1,000 lbs. each, whereas those of th old mill weigh but 850 lbs. Considerable difficulty has been ex perienced in recovering the gold from the rock. As the rock contain no sulphurets, it was thought that the gold might have some sort o coating, but when passed through the mill the tailings showed no fre gold, although they assayed from $1 to $3 per ton. During the spring o 1896 a series of experiments was made which demonstrated quite fully that finer crushing was required to release the gold from the matrix This necessitates finer screens than had ever before been employed but it also was found that a greater percentage of gold was saved though the capacity per stamp was considerably reduced. The materia from the mines consists chiefly of silica; the gold is usually very fine though coarse particles are also found. Since the probable cause o former loss has been discovered, it would appear that little further difficulty need be expected in that direction. The capacity of the pipe-line from the Colorado River has been increased and about 250,000 gals. of water are now delivered in the reservoir, at a cost of about 10 cents per ton of ore crushed. The tailings are settled and the water pumped back to the mills, so that in a measure it becomes a circulating supply. The several mines were found in good condition, with a large ore reserve in sight. The square-set system of timbering is in use, and has thus far proved satisfactory. The timbers are 8″x 10″ and 10″x 10″. Filling stopes with waste is carried on contemporaneously with extraction of ore. Some disastrous caves resulted in the early history of these mines from neglect to observe the necessary precautions in timbering, and when no filling at all was used. Golden Cross Mining and Milling Co., of Los Angeles, owner; T. S. Fuller, manager; John Gray, of Hedges, superintendent.

*Golden Crown Mine* (Quartz).—See Golden Cross.

*Golden Dream Mine* (Quartz).—See White Gold Basin.

*Golden Queen Mine* (Quartz).—See Golden Cross.

*Golden Rule Mine* (Quartz).—See Picacho Mines.

*Golden Sunshine Mine* (Quartz).—See White Gold Basin.

*Goshen Mine* (Quartz).—It is 25 miles N. of Yuma, in Picacho Basin. There are two shafts on the claim, 170′ and 240′ deep respectively. It is one of the Jayne group. Idle.

*Happy Jack Mine* (Quartz).—It is 7 miles N.E. of Descanso, at 4,000′ elevation. A small vein is found in the granite, on which considerable work of a superficial character has been done. A cross-cut tunnel is now being run to intercept the vein, the distance being estimated at 110′. The Iron Mask and War Eagle are included in this property. G. Collier Robbins, of San Diego, owner.

*Harper's Mine* (Quartz).—It is 12 miles E. of Descanso, near Rattlesnake Valley. It is a prospect, having two shafts 50′ deep each. J. D. Harper, of Cuyamaca, owner.

*Hawkes' Mines* (Quartz).—These two claims, *Free Coinage* and *Double Standard*, are on Indian Creek, at 4,200′ elevation. The property has only superficial development. Eugene Hawkes, of Descanso, owner.

*Hedges District.*—This is not an organized mining district, but a portion of the Cargo Muchacho region. The gold-bearing deposits occur as impregnations in hornblendic and micaceous schists. No sulphides have as yet been encountered, even in the deepest levels, and, judging from the appearance of the rock near the surface, it is not likely that they will ever be found in any considerable amount. No fissure veins have as yet been found in the vicinity, though in the southern end of the range, near the old Cargo Muchacho Mine, fissures abound. The entire region north of the big cañon (see Cargo Muchacho region) is a network of pegmatite veins which vary greatly in size, and send out branches in every direction. The dikes usually cut the stratified rocks at some angle. The gold-bearing deposits occur at several geological horizons across a territory a mile wide. The general strike of the formation is N.W. and S.E. The dip varies from 15° to 40° S.W., to which the ore-shoots apparently conform, but they do not pitch directly at a right angle to the strike, but trend to the N.W. as depth is attained. See also Cargo Muchacho District and Golden Cross Mines.

*Helen May Mine* (Quartz).—It is 25 miles N. of Yuma, in Picacho Basin, and is one of the claims of the Picacho group. It has a shaft, and sinking is in progress. S. W. Dorsey, of Denver, owner.

*Helvetia Mine* (Quartz).—See our IXth, Xth, XIth, and XIIth Reports, pp. 145, 542, 376, and 241. It is 1½ miles S.E. of Julian, at 4,000′ elevation. The mine was closed soon after our last Report was issued. There are two shafts, 200′ and 180′ deep respectively, and an 80′ winze below the deepest level. Cause of stoppage not stated. Pacific Bank, of San Francisco, owner.

*Hermit Mine* (Quartz).—See Beyers.

*Hickory Jim Mine* (Quartz).—It is in the Laguna Mountains, 13 miles N. E. of Descanso, at 4,500′ elevation. It has a 100′ shaft and a tunnel 100′ long. J. F. Neeley, of San Diego, owner.

*Hidden Treasure Mine* (Quartz).—It is ½ mile N. of Banner, at 3,200′ elevation, and is worked through a tunnel 300′ long. There is a labyrinth of underground workings above the tunnel level. Bailey Bros., of Banner, owners; Frank Young et al., of Banner, lessees.

*High Peak Mine* (Quartz).—See our Xth and XIIth Reports, pp. 542 and 241. It is ¼ mile E. of Julian, at 4,400′ elevation, and has two tunnels, 40′ and 100′ long respectively. Worked in a small way. Horace Wilcox, of Julian, owner.

*Hubbard Mine* (Quartz).—See North Hubbard.

*Hillside Mine* (Quartz).—It is in Rice District, 12 miles E. of Banner, at 3,800′ elevation. It has a 150′ tunnel and two small shafts on a 2′ vein in granite. Charles McGeary, of Warner, owner.

*Iron Mask Mines* (Quartz).—See Happy Jack.

*Jaeger Mines* (Quartz).—They are 30 miles N. of Yuma, and com prise the *Gold Rule*, *May Queen*, *Minnie*, and *Nugget* claims. The Ma Queen has a 40′ shaft and a cross-cut on the surface 16′ deep. L. J. J Jaeger, of Yuma, owner.

*Jayne Mines* (Quartz).—See our XIIth Report, p. 241. They are i Picacho Basin, 25 miles N. of Yuma, and comprise the *Goshen*, *Mar St. George*, and *Venus* claims. They were in active operation abou 1880, when a 15-stamp mill was built on the bank of the Colorad River, 5 miles from the mines. The mill building is on stone—rhyolit tuff—quarried on the mill-site. A large quantity of rock was crushed which it is claimed paid, but for some reason operations were suspende and never resumed. Dr. DeWitt C. Jayne, of Florida, N. Y., owner.

*Jita Mine* (Quartz).—See White Gold Basin.

*Johnston Mines* (Quartz).—See our XIIth Report, p. 241. These ar in Dulzura District, 30 miles E. of San Diego, at 1,600′ elevation. The are the *Johnston* and *Oneida* mines. On the Johnston a shaft has bee sunk 80′ on a zone of rock containing vein-like masses of fine-graine quartz, in which appears considerable arsenical pyrite. This ore, it i claimed, is rich in gold. A long tunnel was driven across the forma tion to intersect this vein, but to all appearances has not reached it, an is now caved. A second tunnel, with cross-cuts, has been driven severa hundred feet, and a winze sunk on a mass of mineralized felsitic rock which contains a small amount of gold. On the Oneida are severa surface cuts, a 20′ shaft with a 30′ drift, a 5-stamp and a roller mill The rock is low grade and the milling machinery inefficient. With th necessary capital and proper machinery, these mines might possibly make a better record. Charles Johnston, of San Diego, owner.

*Jolly Boy Mine* (Quartz).—It is 3½ miles S.W. of Escondido, nea Crescent Valley, at 750′ elevation. In the spring of 1896 a tunnel wa driven 100′ into a mass of decayed grano-diorite, and a small shaft sunk at another point in the same material. When it was ascertained tha the rock contained no gold the work was suspended. Q. R. Smith, o Santa Ana, owner.

*Julian District.*—See our VIth (Part I), VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 82, 512, 144, 540, 376, and 241. The district include the Julian and Banner region, and is 65 miles N.E. of San Diego. There are a score of mines operating in a small way, partly by owners and partly by lessees. Among these are several new mines. Most of the quartz mined is crushed in custom mills. There are no deep workings in the district. It would seem, however, that the gold-bearing lenses would be found to continue in depth. As the zones are continuous in a com mon direction along the surface, it does not appear that the topography of the county bears any relation to the depth to which these lenses may be found to extend. The mines at and near Julian are 4,000′ to 4,300 elevation.

*Kentuck S. Mine* (Quartz).—See our Xth, XIth, and XIIth Reports pp. 542, 380, and 241. It is ½ mile N.W. of Banner, at 3,400′ elevation. A new tunnel has been driven 70′ on a 6′ vein. The old workings consist of a 97′ shaft, with stopes to the surface, now caved. Also a three-compartment shaft, 100′ deep, substantially timbered, and intersected at the 50′ level by an adit tunnel. L. N. Bailey, of San Diego, owner.

*La Condado Mine* (Quartz).—It is a new claim on La Condado ranch, miles N.E. of Escondido, at 1,500′ elevation. D. W. McKay, of Escondo, owner.

*Little Granite Mine* (Quartz).—It is in Rice District, 12 miles E. of anner, at 3,800′ elevation. It is a prospect, with merely superficial orkings. Rice Bros., of Warner, owners.

*Lucky Ben Mine* (Quartz).—It is near Banner, at 3,200′ elevation. oswell & Walker, of Banner, owners.

*Madden Mine* (Quartz).—See our VIth (Part I) and XIIth Reports, p. 86 and 242. Charles Bacon, of Banner, owner.

*Mars Mine* (Quartz).—It is in Picacho Basin, 25 miles N. of Yuma, 700′ elevation. It has two shafts, each about 240′ in depth; one sunk n the vein and the other in the country rock. It is said drifts have een run from the shaft, in ore, 38′ W. and 78′ E. These workings are ow caved. (See Jayne Mines.) Dr. DeWitt C. Jayne, of Florida, . Y., owner.

*Matamora Mine* (Quartz).—See Jaeger.

*Mesa Grande District.*—See our XIth Report, p. 382. It is 65 miles .E. of San Diego. The northwestward extension of the Julian mineral elt passes through the district. The formation is chiefly mica-schist, ith numerous dikes of coarse-grained granite, in which black, green, nd red tourmaline occur. The mines are mostly idle at present. Some ew prospects were recently found, but at this writing only superficial ork has been done.

*Mina Rica Mine* (Quartz).—See Picacho.

*Minnie Mine* (Quartz).—See Jaeger.

*Moe Mines* (Quartz).—They comprise three claims situated 2½ miles .E. of Escondido, at 900′ elevation. A tunnel has been run 30′ on a ke of silicious felstone, much mineralized. Superficial cuts have been ade on the other two claims. (See Escondido District.) E. A. Moe, Escondido, owner.

*Monarch Mine* (Quartz).—It is a prospect 4 miles N.E. of Escondido, 1,600′ elevation. A. H. Beach, of Escondido, owner.

*Morgan Mines* (Quartz).—These new prospects, discovered in May, 396, are 3 miles N.E. of Mesa Grande. They have only superficial orkings as yet. A. C. Morgan et al., of Mesa Grande, owners.

*Morning Star Mine* (Quartz).—It is in Rice District, 12 miles E. of anner, at 3,500′ elevation. The vein, 12″ to 24″ wide, is a fissure in neissoid rocks. A 70′ shaft has been sunk on the vein. At 50′ a fault as encountered, and the bottom of the shaft is in the country rock. aight & White, of Riverside, owners.

*Mother Lode Mine* (Quartz).—See our XIIth Report, p. 242. It is in ie Cargo Muchacho Mountains, 1 mile N. of the Cargo Muchacho Mine. he vein is 12″ to 4′ wide, and is developed by several tunnels, shafts, nd cuts. A Huntington mill is used to crush the quartz, when the ine is working. Dr. Mathison, of Ogilby, owner.

*Mountain Lion Mine* (Quartz).—It is 6 miles S.W. of Escondido, at 00′ elevation. A vertical shaft has been sunk 65′ on a mass of mineraled felsite. H. C. Brown et al., of Escondido, owners.

*Nana Mine* (Quartz).—See Banner.

*National City Reduction Works.*—They are at National City, and consst of a 10-stamp mill, pans, settlers, etc. Crushing rolls, rotary screens, gs, and 2″ "round-table" concentrators have been recently added.

The "round tables" are 16′ in diameter, and covered with Portlan cement. The additions to the mill have been made for the purpose concentrating the tailings lying about the mill, several thousand tons which are from the Cedros Island Mine, Lower California. B. F. Ma ten, of Redlands, lessee.

*Neptune Mine* (Quartz).—It is a prospect near Banner. W. V Boswell, of Banner, owner.

*N. G.* (*Yellowhammer*) *Mine* (Quartz).—It is in Rice District, 12 mil E. of Banner, at 3,675′ elevation. The vein is solid massive quartz, to 8′ thick, standing nearly vertically, and striking N. 80° W. Th strike of the formation is nearly N. and S. Along one side of the vei is found a series of cavities lined with rudely-formed quartz crystal with gold. An 80′ shaft has been sunk, and a 25′ drift run E. at 30′ fro the surface. There are also several cuts. J. B. Rice et al., of Warne owners.

*Noble's Mines* (Quartz).—See our IXth, Xth, XIth, and XIIth Report pp. 141, 544, 382, and 238. They are the *Bay View*, *Bobtail*, *East En Eureka*, *Oxide*, *Spring*, and *Treasure*, and are about 10 miles E. of Descans at 4,500′ to 5,000′ elevation. These veins resemble those between Julia and Banner, being lenses of granular quartz in mica-schist. The variou claims all have more or less development, consisting of many superficia cuts, tunnels 50′ to 300′ in length, winzes and shafts 20′ to over 100′ i depth. The quartz mined is hand-sorted, and "packed" on burros t the mill, 1½ miles distant by good road. The 1-stamp mill is run inte mittently. Thomas Noble & Sons, of Descanso, owners.

*North Hubbard* (*Hubbard*) *Mine* (Quartz).—See our VIth (Part I XIth, and XIIth Reports, pp. 87, 380, and 241. It is ¼ mile S.W. Banner, at 3,100′ elevation. A cross-cut tunnel has been run 260′ t and a winze is now being sunk on, the vein. There are also some supe ficial workings. The property is equipped with a 5-stamp steam-pow mill. Hazzard & McDowell, of San Diego, owners.

*North Star Mine* (Quartz).—It is a new claim, 1½ miles S.E. of Banne at 3,200′ elevation. There are two veins, on one of which is a 45′ shaf with 40′ and 28′ drifts along the vein. On the second vein there is 115′ shaft, sunk with a horse-whim. J. C. Coffman et al., of Banne owners.

*Nugget Mine* (Quartz).—See Jaeger.

*Oneida Mine* (Quartz).—See Johnston.

*Oriental Mine* (Quartz).—See White Gold Basin.

*Oriflamme Mine* (Quartz).—See our VIth Report (Part I), p. 89. I is 10 miles S.E. of Banner, in a rugged region on the border of the Colo rado Desert. Idle for years. San Diego Development Co., of Bostor Mass., owner.

*Oro Blanco Mines* (Quartz).—They are in White Gold Basin, 30 mile N. of Yuma, and comprise the *Castillo*, *Estrella*, and *Oro Blanco*. The are located on a large zone of crushed and mineralized rock, whic appears to have been felsite. The zone is continuous for several thou sand feet, and lies partly in a cañon, the soft nature of the rock causin it to disintegrate more rapidly than the surrounding unaltered countr rock. The gold found in these deposits is alloyed with silver to such a extent as to give it a white color. It is owing to this fact that the regio in which the vein occurs has been called White Gold Basin. This allo is worth from $12 to $13 per oz. The mineralized zone is more tha

)0′ wide, and all the tributary gulches have been "placered" by Mexi-ıns, with dry-washing machines. W. Swain, of Picacho, owner.

*Oro Fino Mine* (Quartz).—See our XIIth Report, p. 242. It is a pros-ect 2 miles S.E. of Escondido. F. H. Roberts, of Escondido, owner.

*Overlook Mine* (Quartz).—See Banner.

*Owens Mine* (Quartz).—See our VIth (Part I), VIIIth, IXth, Xth, nd XIIth Reports, pp. 85–87, 519, 144, 541, and 242. It is at Julian, at ,300′ elevation. Since our last Report operations have been resumed at ıis mine. The shaft is 350′ deep, vertically. A drift is being driven on ıe lowest level of the mine, in which some good gold-bearing quartz is )und. The 10-stamp mill is being put in good condition, and this quite ımous mine will probably soon become again a bullion-producer. Owens ons. Mining Co., owner; H. A. Williams, of Julian, superintendent.

*Oxide Mine* (Quartz).—See Noble's.

*Oxide Mine* (Quartz).—It is a prospect near Crescent Valley, 3 miles .W. of Escondido. (See Escondido District.) D. Crise, of Escondido, wner.

*Padre y Madre Mines* (Quartz).—They are in the Cargo Muchacho Iountains. Idle for years. Lloyd Tevis, of San Francisco, owner.

*Pasadena Mine* (Quartz).—See our XIth Report, p. 386. It is in the argo Muchacho Mountains, at 800′ elevation. The mine has not been ctively operated for several years, though a man is kept employed in rospecting work most of the time. Thomas Grimes et al., of Pasadena, wners.

*Paymaster Mining Co.*—See Cargo Muchacho.

*Picacho Basin.*—It is 25 miles N. of Yuma, and about 5 miles from the olorado River. The basin consists of low, rolling hills, covered in art by washed gravel and detritus from the neighboring hills. These ıperficial deposits are gold-bearing, and have been worked by Mexicans nd Indians for years, the gold being formerly separated by tossing the ghter material in blankets in the wind, and recently by dry-washing ıachines. Some years since the entire tract was consolidated under the tle "California Picacho Company," and a pumping plant erected on the ank of the river. It was a failure. The rock formations underlying ıe superficial deposits are micaceous and hornblende schists, diorite, nd a few intrusive dikes, mostly granitic. On the east, south, and west, eep, rugged hills of rhyolite, rhyolite tuff, and andesitic rocks occur; ıe most prominent mass being the rugged ridge called Picacho (peak), hich is only a remnant of the vast field of eruptive rock which once overed the country for many miles. The Picacho rises 1,500′ above ıe Colorado River, and was probably at one time much higher than ow. A great number of claims have been located, and considerable ork done. The absence of gold-bearing quartz veins in the district is a oticeable and unusual feature.

*Picacho Mines* (Quartz).—They are in Picacho Basin, 25 miles N. of uma, and comprise the *Apache*, *Dulciana*, *Eastern California*, *Golden asket*, *Golden Rule*, *Mars Extension*, *Mina Rica*, and *Tierra Rica*. They djoin and surround the claims of the Jayne group. The claims are eing developed, with encouraging prospects. S. W. Dorsey, of Denver, wner; F. Guerra, of Picacho, superintendent.

*Pine Ridge Mine* (Quartz).—It is a prospect in Rice District, 12 miles . of Banner, at 3,700′ elevation. C. Helm, of Warner, owner.

*Pine Valley District.*—See our IXth, Xth, XIth, and XIIth Reports pp. 141, 544, 382, and 242. The mines of the district are found in granite and mica-schist. The region properly includes the mines of Dee Park and Rattlesnake Valley. The quartz in the schist is of the rather vitreous, granular sort, similar to that found near Banner and Julian, and, as at those places, occurs in a series of lenses. The veins are in the granite, and some of the quartz is rich. Generally speaking, the rock of this district contains more than $5 per ton, though some of it is worthless.

*Ponce de Leon Mine* (Quartz).—See White Gold Basin.

*Pot Holes* (Placer).—See our XIIth Report, p. 242. These mines are worked in a very desultory way by a few Mexicans.

*Ranchita Mine* (Quartz).—It is 1½ miles S.E. of Banner, at 3,300 elevation. The mine was discovered since our last Report, and is an unusual one in some respects. The formation is mica-schist, striking N.W. and dipping 70° N.E. In this schist, which is probably a metamorphosed, sheared granite, is found a series of nearly parallel, somewhat irregular, quartz lenses, which cut the strike of the schistose rock at an angle of about 20°. These lenses appear to terminate upon reaching what seems to be a fault-plane striking nearly E. and W. The quartz bodies are 12″ to 3′ thick, and are found 4′ to 5′ apart for some distance along the fissure above referred to. A somewhat similar occurrence was noted at the Starlight-Riverside Mine in Madera County. A 145′ inclined shaft has been sunk, several levels opened, and considerable stoping done. The rock is crushed in a custom mill at Banner. C. J. Couts, of San Diego, owner; John C. Coffman, of Banner, superintendent.

*Ready Relief Mine* (Quartz).—See our VIth (Part I), VIIIth, IXth, Xth and XIth Reports, pp. 87, 513, 147, 543, and 378. It is at Banner, at 2,900′ elevation. It is worked through three adits, and has a good 10-stamp water-power mill. A 12′ Pelton wheel, under 600′ pressure is used. This wheel was constructed by bolting Pelton buckets on the periphery of the flywheel of an engine, the cylinder of which has been converted into an air-compressor. Idle. Bailey Bros., of Banner, owners.

*Redman Mine* (Quartz).—See our VIth (Part I) and XIth Reports pp. 87 and 380. It is at Banner, at 2,800′ elevation, and is the north extension of the Ready Relief Mine. The principal developments consist of a vertical shaft, 113′ deep, and a tunnel on the vein 120′ long which intersects the shaft 25′ from the surface. Nine inches of water under a 650′ head, is used in an "ejector" to raise the three inches from the mine. Bailey Bros., of Banner, owners.

*Rica Tierra Mine* (Quartz).—See Picacho.

*Rice District.*—It is about 12 miles E. of Banner and southerly from Warner, on the western border of the Colorado Desert. The formation is metamorphic, consisting of mica-schist, gneissoid rocks, quartzite, and limestone, and lies near a large granite area. The veins are well-defined fissures, cutting the rocks both in strike and dip. Several veins were found to be faulted in some places, with considerable displacement, and in others by side thrust, to overlap. The claims thus far located are in the prospective stage. There are no mills or mining machinery in the district.

*Ruby Mine* (Quartz).—See our XIth Report, p. 380. It is at Banner. 5-stamp mill belongs to the property. Idle.

*San Diego Mine* (Quartz).—It is near the Helvetia Mine, 1 mile S.E. f Julian, at 4,000′ elevation. A new 125′ inclined shaft has recently een sunk, at an angle of 70°. It has a steam hoist, but no mill. W. R. Ialone, of Salt Lake, Utah, owner; H. A. Williams, of Julian, agent.

*San Felipe Mine* (Quartz).—It is ½ mile E of Banner, at 2,800′ eleva- on. The vein strikes N. and S., and dips nearly vertically. The walls re granite. A shaft is sunk 30′ on a vein, 12″ to 18″ wide. The rock ill be hauled to the Ready Relief mill at Banner. Bailey Bros., of anner, owners.

*St. George Mine* (Quartz).—See Jayne.

*Shenandoah Mine* (Quartz).—See our XIth and XIIth Reports, pp. 382 nd 242. It is 1½ miles N.E. of the Indian rancheria at Mesa Grande, t 3,200′ elevation. It has a 175′ shaft, equipped with a steam hoist, nd a 5-stamp mill. S. A. McClure, of San Diego, owner.

*South Hubbard Mine* (Quartz).—See our VIth (Part I) and XIth eports, pp. 87 and 380. It is ½ mile W. of Banner, at 3,000′ elevation. he vein strikes N.W. and dips 45° N.E. A 300′ cross-cut tunnel strikes he vein 200′ below the surface. Drifts have been run 90′ S.W. and 400′ .W. An open shaft connects this adit level with the surface. Bailey Bros., of Banner, owners.

*South Ruby Mine* (Quartz).—It is a prospect, near Banner. N. Barry, f Riverside, owner.

*Spike Mine* (Quartz).—See Beyers.

*Spring Mine* (Quartz).—See Noble's.

*Stonewall Mine* (Quartz).—See our VIth (Part I), VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 89, 515, 143, 540, 382, and 243. It is on he Cuyamaca Grant, 10 miles S. of Julian. Idle for three years past. ather Banking Co., of San Francisco, owner.

*Sundown Mine* (Quartz).—It is a prospect in Rice District, 12 miles E. f Banner; has a 10′ shaft. Mrs. C. Helm, of Warner, owner.

*Tierra Rica* (Quartz).—See Picacho.

*Treasure Mine* (Quartz).—See Cable.

*Treasury Mine* (Quartz).—See Noble's.

*Valentine Mine* (Quartz).—It is a prospect, 2 miles S. of Julian, at ,700′ elevation. E. A. Stanley, of Banner, owner.

*Valley View Mine* (Quartz).—It is a prospect, in the Rice District, 12 niles E. of Banner, at 4,000′ elevation. Rice Bros., of Warner, owners.

*Venus Mine* (Quartz).—See Jayne.

*War Eagle Mine* (Quartz).—See Happy Jack.

*Warlock Mine* (Quartz).—See our Xth and XIIth Reports, pp. 544 and 43. It is 1 mile N.W. of Banner, at 3,300′ elevation. W. H. Bradley t al., of Los Angeles, owners.

*Washington Mine* (Quartz).—See our XIIth Report, p. 243. It is at ulian, at 4,200′ elevation. It has a shaft 125′ deep. Idle. S. A. Mc- Dowell, of San Diego, owner.

*Wilcox Mine* (Quartz).—See our XIIth Report, p. 243. It is at Ban- ner, at 3,100′ elevation. Idle. L. A. Lee Electric Supply Co., of San Francisco, owner.

*Wildcat Mine* (Quartz).—It is at Mesa Grande; prospect only.

*White Oak Mine* (Quartz).—It is 4 miles N. of Escondido, at 1,000 elevation. A prospect, having a 25′ shaft. J. N. Turrentine et al., o Escondido, owners.

*White Gold Basin.*—It is 30 miles N. of Yuma and 4 miles E. of Pica cho. The hills of the basin are rugged, but not high. It is almost com pletely surrounded by higher peaks and ridges of rhyolite and rhyolit tuff. The rocks of the basin are diorite, phthanite, mica-schist, horn blende-schist, granulite dikes, and felsitic eruptives. In this region ar five parallel zones of fracture. The zones are from 20′ to over 100 wide, and show signs of great crushing and extensive mineralization These great fissures are connected by other fractured zones crossing fron one to another at varying angles. These are also mineralized, and al are gold-bearing, though mostly low-grade. A very large number o claims have been located, but as yet only a little work has been done The region is one of possibilities, being near the Colorado River, and a an average of 300′ above it. See White Gold Basin Mines.

*White Gold Basin Mines* (Quartz).—They are in White Gold Basin 30 miles N. of Fort Yuma, and comprise a large group of claims, viz. *Albert Polhamus*, *Alcyon*, *Alfonso*, *Gold Crown*, *Golden Dream*, *Gold Hill Golden Sunshine*, *Jita*, *Oriental*, and *Ponce de Leon*. They have super ficial development. D. K. Allen, of Picacho, owner.

*Yellowhammer Mine* (Quartz).—See N. G.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Beyers* | Water | 2 | 950 | | | | | | | |
| Blossom | | 10 | 850 | | | | | | | |
| Cargo Muchacho | | 20 | 850 | | | | | | | |
| Eureka | Steam | 2 | 850 | | | | | | | |
| | Steam | 5 | 850 | | | | | | | |
| Golden Cross | | 40 | 850 | 90 | | | | | | |
| Gold King and Gold Queen | | 10 | 850 | | | | | | | |
| Golden Queen | Steam | 100 | 1,000 | 225 | | | | | | |
| Helvetia | | 10 | 850 | | | | | | | |
| Mars | | 15 | 750 | | | | | | | |
| National City Reduction Works | Steam | 10 | 850 | | 2 | Rd. Tables | | | | |
| North Hubbard | | 5 | 800 | | | | | | | |
| Oneida | | 5 | 400 | | | | | | | |
| Owens | | 10 | 850 | | | | | | | |
| Ready Relief | Steam | 10 | 850 | | 3 | Hendy | | | | |
| Shenandoah | | 5 | 850 | | | | | | | |
| Stonewall | Steam | 60 | 850 | | | | | | | |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SAN DIEGO COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Artery Consolidated | Gas | | Arrastra | | | | | | | | |
| Beyers | | 1 | Arrastra | | | | | | | | |
| Clark | | | Arrastra | | | | | | | | |
| Mother Lode | | | Huntington | | | | | | | | |
| Oneida | | 1 | Roller | | | | | | | | |

## San Luis Obispo County.

This county consists of mountain, foothill, and valley lands suitabl for grazing, agricultural, and horticultural purposes. The stock-raisin and dairy industries are important sources of revenue. The principa mineral industry at present is that of bituminous rock, which als promises well for the future. The quarry of "California onyx" is worke intermittently, and gold is said to have been mined profitably fron placers in the La Panza District, in the eastern part of the county The mineral springs are widely known for their medicinal qualities an are, in part, well-improved and much-frequented resorts. Clays suit able for bricks exist within the county and are developed to th extent required by the local demands. There is also a variety of othe mineral resources, some of which have been developed to a limite extent, but are now generally idle; *e. g.*, antimony, chromic iron, quick silver, gypsum, diatomaceous earth, limestone, etc. Some irrigation i carried on, principally along the Arroyo Grande, by diverting wate from that stream through small farm ditches on the fertile valley lands

*King David Mine* (Quartz).—It is in the La Panza Mining District about 45 miles E. of San Luis Obispo. The development consists of a 6′x 8′ shaft, 60′ deep, for prospecting a 4½′ vein of quartz, inclosed in a granitic formation. Four men are employed. King David Mining Co. owner; John Mason, of La Panza, superintendent.

*Placer Mines.*—See our VIIIth, Xth, and XIIth Reports, pp. 530, 578 and 243. Gold occurs in streams and numerous ravines in the La Panza District. Three thousand dollars was produced in 1895, principally in Navajo and De la Guerra creeks and tributaries. On account of the limited water-supply, the mines are worked only in the rainy season.

## Santa Barbara County.

*Abernathy Mine* (Beach).—It is on the beach, 3 miles N. of Point Sal. The gold occurs in black sand, and is saved by washing over canton flannel. Four men are employed. N. Marsh and S. N. Nash, of Guadaloupe, owners.

*Anna Moore Mine* (Quartz).—It is on San Lucas Creek, 30 miles N.W. of Santa Barbara. The development consists of a 150′ tunnel. Four men are employed in development. Hiram Pierce, of Santa Barbara, owner; W. J. Reseigh, of Santa Ynez, superintendent.

## Santa Cruz County.

The economic mineral resources of this county consist principally of bituminous rock and limestone, which promise to continue as important sources of revenue. A limited quantity of gold is disseminated through the beach sands and also in a belt traversing the county N. W. and S.E., in the vicinity of the granite rocks, but its exploitation has not been remunerative. The clay suitable for pottery, etc., exists, but is undeveloped; that suitable for brick is abundant and developed to the extent demanded by the local market. A number of artesian wells exist in

ıe valley lands about Watsonville. The county lying, as it does, on ıe southwestern slope of the Santa Cruz Mountains, its streams, flowing award, have considerable fall, and the more important ones afford ater-power, which is only partially utilized.

## Shasta County.

*Alice Mine* (Quartz).—See our XIIth Report, p. 245. It is 6 miles W. om Ono, at about 2,100′ elevation. J. J. Murray, of Ono, owner.

*Alice Mine* (Quartz).—See our XIIth Report, p. 245. It is 2½ miles . of Shasta. D. B. Hunt et al., of Stella, owners.

*Alliance Mine* (Quartz).—It is 5 miles W. of Redding, at 730′ elevaon. The N. and S. vein, between granite walls, is filled partially with ecomposed granite, and upon which is a 45′ tunnel. One man is at ork. Mrs. Lathrop, of Redding, owner.

*Alphabetical Mine* (Drift).—See Dog Creek Ancient Channel Drift ravel.

*Alvina Mine* (Quartz).—It is 4 miles N. of Horsetown, at 1,200′ elevaon, and comprises four full claims near Sawmill Gulch. They are esignated as the *Alvina*, *Bluejay*, *Gray Fox*, and *Mountain Quail.* he first two veins are about 3′ wide, trend N. and S., crossing Clear reek, and dipping E. on the contact of granite and diorite. The cropings for 200′, yielding coarse gold, have been placered with 10 inches of ater from Sawmill Gulch, through a ditch 1 mile in length and 1′ wide n the bottom. A tunnel has been started on the vein where it crosses the reek, and will give 700′ of backs. There is an 18′ shaft and two smaller nes on the Bluejay, besides several open cuts. The Mountain Quail nd Gray Fox are parallel claims on E. and W. veins running to the lvina. Cheap water-power and timber are available for any purpose. wo men are at work. E. P. Conners, of Redding, owner.

*American Mine* (Quartz).—See our XIIth Report, p. 245. It is situted on Kline's Gulch, 3½ miles N.W. from French Gulch. J. Conant, f Redding, owner.

*Anavina Mine* (Quartz).—See our XIIth Report, p. 245. It is 8 miles rom Redding and 3 miles from Muletown, and consists of three claims, t 1,300′ elevation. Since our last Report only assessment work has een done. H. Christian and Mrs. Doeblein, of Igo, owners.

*Annie Mine* (Quartz).—It is 2 miles W. from Shasta, at 1,050′ elevaion, and comprises two claims, designated as the *Annie* and the *Shasta.* he former is 3′ wide, trends E. and W., and dips 45° N., between a slate anging-wall and a porphyry foot-wall. It is being exploited. The cropings on the Shasta vein are 30′ to 40′ wide, and the rock is quite low rade. P. P. Willetta, of Shasta, owner.

*Australian Mine* (Quartz).—See New Year and Australian.

*Balakalala Mine* (Quartz).—See *Balaklava*, in our XIIth Report, . 245. It is 7 miles N.W. from Copley, at 2,330′ elevation, and conains eleven claims on a mineral belt carrying gold, silver, copper, and ron, with a pronounced gossan outcrop trending N.E. The ore-body aries, swelling in places to over 100′ in width, with a probable average f 50′. The ore presents large masses of solid copper and iron sulphides, vith occasional copper silver glance, black oxides of silver and copper, nd native copper. The developments consist of four tunnels, 800′, 200′,

80′, and 70′ long, respectively, along the outcrop, and a few shallow shafts, the deepest being 90′. The facilities for tunneling into the ore body from Squaw Creek Cañon are very good. A water-right of 40 inches on the North and South Forks of Squaw Creek may be utilized with 2½ miles of flume, and water delivered under 650′ pressure. Six men are employed. — Murray et al., of Shasta, owners.

*Backbone Mine* (Quartz).—It is 4 miles S.W. from Kennett, at 2,100′ elevation, and contains four claims on a N.W. and S.E. vein, supposedly the same gossan outcrop as the Iron Mountain Mine. The developments consist of several shafts and tunnels; the deepest shaft is 60′, and there is a cross-cut tunnel 200′ long, which has not reached the ore-body. Two men are at work. D. McCarthy, — Saeltzer, et al., of Redding, owners.

*Bay State Mine* (Quartz).—See Indiana.

*Big Four Mine* (Quartz).—It is 4 miles S.W. of Shasta, at 750′ elevation. The 5′ vein trends N.W. and S.E., and dips 60° N.W., between slate walls, carrying high-grade sulphurets. The developments consist of 150′ of open cut and a 60′ incline. Four men are at work. Water is obtained from Clear Creek.

*Billy McCormick* (*Jackson*) *Mine* (Quartz).—It is on the Mule Spring Divide, 13 miles N.W. from Ono, at 4,700′ elevation. The 4′ 8″ vein courses N.W. and S.E., between slate and porphyry walls. There is a 35′ tunnel on the vein. Two men are at work. Wm. McCormick, of Ono, owner.

*Black and Brown Bear Mine* (Quartz).—It is 6½ miles W. of Kennett, at 1,500′ elevation, and comprises eleven claims on a N.E. and S.W. vein in porphyry, extending in places to 20′ in width. There is a 1,000′ tunnel on the vein and a 10-stamp mill, provided with both steam and water power. Water is brought from the South Fork of Squaw Creek through a pipe-line giving 150′ head. The mill has two Triumph concentrators and a 10-section canvas plant. Idle. G. Bliss, of New York, owner.

*Black Bear Mine* (Quartz).—See Harrison Gulch Mines. D. Lily, of Palo Cedro, and Hunter & Fitzpatrick, of Redding, owners.

*Black Prince Mine* (Quartz).—It is 2 miles N.W. from Igo, at 1,400′ elevation. The vein trends N.E., dips 45° E. between granite and slate, and varies from simple vein-filling with a few distinct quartz seams to 37′ of solid quartz carrying base silver ores and free gold. A 110′ shaft is sunk and drifts extended 115′ E. and 75′ W. The hoisting is done with a horse-whim and the water removed by bailing. A 40′ adit has been started. Assessment work only. S. W. Robinson, of Igo, owner.

*Blackfoot Mine* (Quartz).—See our XIIth Report, p. 245. It is 4 miles S. of Shasta. W. A. Boswell, of Shasta, owner.

*Black Spider Mine* (Quartz).—See our XIIth Report, p. 246. It is near Shasta. J. Bell and J. Scranton, of Shasta, owners.

*Bluejay Mine* (Quartz).—See Alvina.

*Bonanza Mine* (Quartz).—See Salt Creek.

*Bowery Belle Mine* (Quartz).—It is situated 2½ miles N.E. from Shasta, at about 800′ elevation, and comprises five claims, designated the *Bowery Belle*, *Extension*, *Industry*, *Minnehaha*, and *Yankee Blade*. The first, fourth, and fifth are on an 8′ vein, which courses E. and W., and dips 70° N., in porphyritic granite. The Industry and Extension claims are on side veins, 8′ wide, 80′ apart, and about 600′ S. of and trending

ward the main vein. The main vein carries ribbon quartz, partly ushed, near the walls, and a glassy, massive quartz in the center. The ine is opened through tunnels; the upper is a 75′ cross-cut, with a 102′ rift on the vein, and showing an 11′ vein in the breast. Another tun- el, 100′ below, runs 400′ on the foot-wall side. Beyond these are a umber of shallow inclines from 12′ to 20′ deep. Two men are at work. - Kahn and J. C. Burgbacher, of Redding, owners.

*Brunswick Mine* (Quartz).—It is 5 miles W. of French Gulch, at 4,000′ evation, and contains five claims on a N. and S. vein in porphyry, hich dips 60° W. and varies in width from a few inches to several feet. he quartz carries but few sulphurets. Developments consist of two unnels on the vein at comparatively shallow depth, and a 280′ cross-cut the deepest point of the claim, which will have to be extended 400′ to ach the vein. Ten men are at work. — Rossi and H. Cockran, of rench Gulch, owners.

*Bullard & Vandever Mine* (Quartz).—See our XIIth Report, p. 259. is 12 miles N.W. of Redding, at 975′ elevation, and comprises two aims, designated the *Santa Rosa* and *Scottish Chief*. The vein is 5′ ide, trends N. and S., and dips 60° S., between syenite and diorite. he most developments are in the former. These consist of a 450′ cross- ut to the vein and a 150′ drift thereon. There is another tunnel 85′ elow, which is 200′ long, and is connected with the other by an upraise. third tunnel is driven 200′ along the vein. All the stoping has been one between the upper levels and the surface. On the Santa Rosa are vo tunnels, each 200′ long. With steam-power a 3½′ Huntington mill uns at 70 revolutions per minute, reduces 4 tons per day, saving 80% of he amalgam inside. A canvas plant of seven sections, 22′ long, yields tons of rich slimes per month. Three miner's inches of water are aken from a ditch out of Spring Creek belonging to A. B. Paul, of San rancisco. This ditch is 2½ miles long, 2′ wide on top, 18″ on bottom, ′ deep, with ½″ grade per rod. Seven men are employed. Bullard & andever, of Shasta, owners.

*California and Oregon Mine* (Quartz).—It is in Flat Creek District, 3 iles S.W. from Kennett, at 750′ elevation, and comprises two claims n two parallel veins which trend N.W. and S.E., and dip vertically, etween porphyritic walls. The California vein is 3′ and the Oregon 5′ ide. Both carry a good grade of copper sulphides. There is a 40′ shaft n the California, besides several surface cuts. A shaft has been started on he Oregon. Two men are employed. A. J. Burnett and J. S. Smithson, f Kennett, owners.

*Central Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 565 nd 246. It is 7 miles N.W. of Redding, at 1,150′ elevation, and com- rises 60 acres. The vein varies from a seam to 14′ in width, trends N. nd S., and dips 60° W., between slate walls. There are two tunnels at ifferent levels, the upper one being 500′ and the lower 1,300′ long, with n 83′ winze below the upper level; some stoping has been done above he upper level. Two men are employed. W. F. Whitehouse and G. Bliss, of New York, owners.

*Clipper and Snider Mine* (Quartz).—See our XIIth Report, p. 246. It s at the head of Squaw Creek, 7½ miles W. of Kennett, at 2,300′ eleva- ion. The vein, 1′ to 8′ wide, trends E. and W., and dips 45° N., between orphyry walls. The Snider is not being worked. On the Clipper the 4½′x 9′ incline is 200′ deep, with 30′ sump. A 250′ adit cuts the shaft

at 50'. At the 100' and 200' stations are drifts 100' and 200' long respec tively. Two pay-shoots have been developed and extensively stoped The hoisting is done with a single drum operated by a 16 H.P. engine The water is removed by a 50-gal. barrel, requiring half a day's hoistin per week. The ore is very heavily sulphuretted, up to 15% in places The 10-stamp steam-power mill is idle. It has two Frue concentrator and a 30'x 20' canvas plant, set on 1½" grade per foot. Fourteen men are employed. J. Barron, of Kennett, and T. Lenasse, of Alameda owners.

*Colorado* (*Remonia, D. & B.*) *Mine* (Quartz).—See our XIIth Report p. 246. It is 2 miles S.W. from Shasta, at about 1,100' elevation. E. F Connor, of Shasta, owner.

*Consolidated Kosciusko* (*Original Quartz Hill*) *Mine* (Quartz).—See our XIIth Report, p. 254. It is 4½ miles S.W. of Redding, at 975' approximate elevation, and contains three full claims. Since our last Report the quarrying of the large quartz outcrop has been discontinued, and exploitations, by shafts and tunnels 125' below the outcrop, have been started, proving that in depth a better grade of ore prevails in part carrying on the pay-shoot, besides the gold and iron sulphurets, native and chloride silver and native copper. Ten electric slime-tables have been added below the canvas plant; also a dynamo of 110-voltage Each of the 10 electric slime-tables requires a 25 arc-light force. These tables are 6'x 10', and set on a ¾" to 1' grade. The pulp from the canvas plant is sized by a "spitzkasten"-pointed box; the coarse material is allowed to go to waste, and the slimes passed to the head sluice, which distributes them to the table through a number of openings regulated by zinc gates, connected by wire with the positive pole of the dynamo. Four feet from the head of the table are a series of magnets running across it fitted in level, 3" wide, and connected by wire with the opposite pole of the dynamo. The sulphide slimes, in passing over the tables, collect on the magnets, from which they are washed every three quarters of an hour, and collected in slime-boxes. About two tons are thus obtained per month, assaying $225 per ton. The dynamo used also furnishes 17 lights in the mill and around the buildings. Forty-five cars of ore, in trains of four cars, drawn by horses, are delivered to the mill per day over the 3½ miles of tramway. The water-power for the mill is obtained from the Calumet Co.'s ditch, which diverts the water from Spring Creek and brings it through 7 miles of ditch, flume, and pipe-line; the latter is 18" diameter and 1 mile long, crossing the Sacramento River on a suspension bridge. The water is delivered under 220' pressure to a Knight wheel. The ditch and flume (5'x 3') have a capacity of 120 inches, but after July the evaporation prevents that amount from reaching the mill, requiring the hanging-up of part of the stamps. Forty-one men are employed. An incorporated Polish company, of Chicago, owner Dr. K. W. Medowicz, of Redding, president and superintendent.

*Copley and Diamond King Mine* (Quartz).—It is at Copley, at 700' elevation, and contains two locations on a vein 3' wide, trending N.W., and dipping 60° N.E., between porphyritic walls. The developments include some open cuts, a 250' tunnel on the vein, and an upraise. Two men are employed. J. R. King, of Copley, owner.

*Corinne Mine* (Quartz).—See Salt Creek.

*Cortez Mine* (Quartz).—See our XIIth Report, p. 70, where this mine was erroneously inserted under "Copper." It is 9 miles S.W. of Round Mountain. Idle. A. J. Cook, of Eilers, owner.

*Crown Point Mine* (Quartz).—It is 6 miles W. from Delta Station, at 300′ elevation, and comprises three claims. The vein is 2′ wide, trends . and W., and dips 65° S., between diorite and trachyte walls. There re two tunnels on the vein, 45′ apart, 300′ and 70′ long, respectively; ne latter is connected by a 140′ upraise with the surface. The ore carries % sulphurets. Two men are employed. L. Johnson, of Delta, owner.

*Crown Point Consolidated Gold Mining Co.'s Mines* (Quartz).—They re S.W. of Redding, at 1,400′ elevation, and comprise three claims, here esignated as the *Crown Point*, *Jeannette*, and *Midnight*, besides some aims near Shasta. The 3′ vein has a N.W. and S.E. course, and dips 5° E., between slate walls. The developments consist of a 100′ shaft n the Midnight, one 47′ deep on the Crown Point, and one of 20′ on the eannette; also a 100′ cross-cut on the Midnight. A tunnel is now being riven on the Crown Point. The outcrop shows free gold, but 40′ below ne ore becomes heavily sulphuretted. Seven men are employed. Par- er, Fowler, Walters, et al., of Oakland, Alameda County, owners.

*Daisy Mine* (Quartz).—It is on Highland Mountain, 5 miles N. of rench Gulch, at 3,300′ elevation, and consists of a tunnel-right. To ate the tunnel is in 850′, and is being continued to the porphyry and ate contact. A 120′ air-shaft is 340′ from the mouth. Only a few uartz stringers have been cut so far. C. Smith, J. & D. Southerland, f French Gulch, and J. Earle and G. Reinhauss, of Shasta, owners.

*Dayton Mine* (Quartz).—See Diamond.

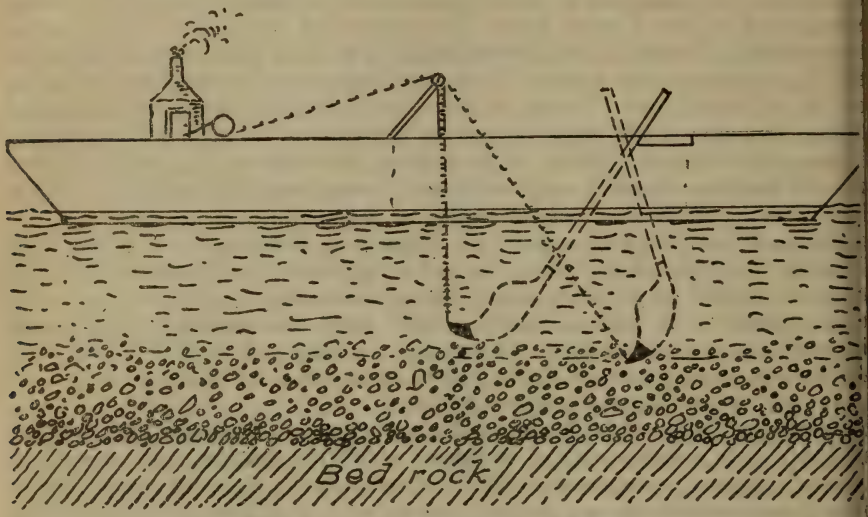
*Deakin & Taylor* (*Old Spanish*) *Mine* (Quartz).—See our XIIth Report, . 246. It is 5 miles west of Redding, at 850′ elevation, and comprises everal claims, designated as the *Enright*, *South*, *Spanish*, and *Taylor*. he present workings are on the Spanish vein, of 3′ average width, which rends N. 70° E. A 4′x 8′ perpendicular shaft, 90′ deep, shows a vein n the bottom 8′ wide, carrying 1½% of high-grade sulphurets. On the aylor vein, coursing N. 70° W., is a 200′ tunnel connecting with a 65′ haft. On the south lode, coursing N. 55° E., is a tunnel 125′ long, and n the Enright, coursing N. 82° W., is a 140′ tunnel on the vein. Eight nen are employed. Deakin & Taylor, of San Francisco, owners; J. C. rick, of Shasta, superintendent.

*Delta Mine* (Quartz).—It is 5 miles W. of Delta Station, at 2,000′ levation, and comprises two mining and two timber claims. The well- nineralized 3′ vein trends E. and W., and dips slightly S., between slate nd diorite walls. A 250′ cross-cut to the vein gives 85′ of backs, and has een drifted 250′ on the vein, proving 150′ of a pay-shoot. A little toping, 35′ above the drift, has been done. A second tunnel 125′ long as been driven on a parallel vein. The ore carries about 3% of high-grade ulphurets, and is reduced in a 12′ arrastra, run by a horizontal water- vheel under 50′ pressure, crushing 1,400 lbs. at a charge. They save ,500 lbs. of sulphurets (concentrates) per month on 48′ of 24″ carpet. Water is obtained from Dog Creek through ¼ mile of ditch, with a apacity of 250 inches. Three men are at work. M. B. Butler, of Bayles, wner.

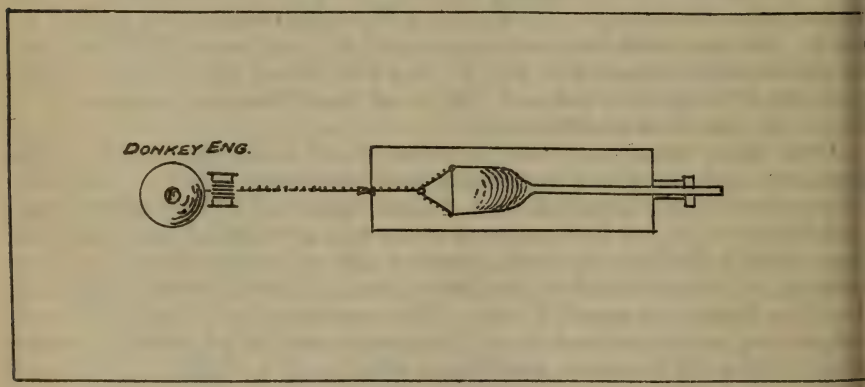
*Delta Lava Cap Mine* (Drift).—It is ¾ mile from Delta Station, at ,450′ elevation, and comprises 20 acres between the Sacramento River nd Dog Creek. The gravel shows regular river-wash, and is apparently former bench of the Sacramento River, lava-capped, and carrying oarse gold. A 130′ bedrock tunnel has been driven and a 30′ upraise

made into the gravel, but no gangways or breasts have been laid off. Two men are at work. G. K. Deming et al., of Redding, owners.

*Diestelhorst Dredger.*—In the Sacramento River, near Middle Creek Station, 3 miles above Redding, is a dredger, anchored in the middle of the river, which raises the bottom gravel with a scoop having a shear steel bit and a capacity of $\frac{1}{3}$ cu. yd., and deposits it on vibrating screens that drop the waste back into the river, while the finer material is led




DIESTELHORST DREDGER.




to a string of sluices with riffles to catch the gold; the tailings drop over the side near the stern. The scoop is attached to a stout, long arm (3″ x 25′), and fastened by chains operated by steam winches that permit it being dropped into the river between two sections of the boat. When dropped into the water the current carries the scoop backward while sinking until it rests, bit downward, on the gravel, and the arm rests against the cross-tie uniting the two sections of the dredger. The scoop is then forced forward by steam-power into the gravel with a strain equal to 3,000 lbs., and raised with its load of gravel by a chain

errick, swung around on a turntable above the apron and screen, here it is dumped by hand. The gravel is said to be 7′ thick, and the act that several more dredgers are being built and placed in the rivers would prove that they are remunerative. Seven men work night and day. Diestelhorst Bros., of Redding, owners.

*Diamond* (*Dayton*) *Mine* (Quartz).—It is 6 miles N.W. from Igo, at ,350′ elevation, and embraces three full claims, designated as the *Diamond*, *Extension*, and *North Hope*, and a fraction of the *Manzanita*. The eins vary from 6″ to 4′ in width, trend N.E., and dip about 30° S.E., n a cross-grained granitic rock. The vein-filling is partly granite. The evelopments consist of a 300′ tunnel, a second one started lower down, nd a shaft started to connect the two tunnels. Two men are at work. . W. Robinson, of Igo, owner.

*Doeblein's Mine* (Hydraulic).—See our XIIth Report, p. 247. It is 2 niles E. of Igo, at 1,200′ elevation, and comprises 60 acres of gravel overying a conglomerate, which serves as bedrock. This gravel is tight, with omewhat "rusty," scaly gold throughout, and carries considerable clay. he gravel is worked in a bank from 12′ to 25′ in thickness in several uts, the chief one being 125′x 150′x 25′. This, with adjoining ground, ontaining 400 acres, is bonded to parties who are bringing in a 10-mile itch from Bowlder Creek of a capacity of 1,000 miner's inches, to be elivered generally under 200′ pressure. John Doeblein, of Igo, owner.

*Dog Creek Ancient Channel Drift Gravel* (*Alphabetical*) *Mine* (Drift).—t is situated 1 mile W. of Delta, at 1,700′ elevation, and contains 160 cres of an ancient channel, supposed to be part of the old Sacramento River drainage. A bedrock tunnel is being driven on the north bank f Dog Creek under a lava-capped ridge, and is now 180′ long; at 140′ n upraise has been started to locate the position of the channel. The ava cap is about 25′ thick, lying generally directly on the gravel, only few spots showing intervening pipe-clay. Four men are at work. An ncorporated company, of Redding, owner; C. E. Brown, of Delta, superntendent.

*Dolcoath Mine* (Quartz).—See our XIIth Report, p. 247. It is 2 miles E. of Shasta. H. A. Wiser et al., of Shasta, owners.

*Dreadnaught Mine* (Quartz).—See our XIIth Report, p. 247. It is miles N.W. from Shasta. A. T. Molin, of Shasta, owner.

*Dry Creek Tunnel and Fluming Co.* (Hydraulic).—See Hardscrabble.

*Eagle Bird Mine* (Quartz).—See Harrison Gulch.

*Eastern Star Mine* (Quartz).—See our XIIth Report, p. 247. It is 14 miles S.W. from Redding. J. W. George, of Igo, owner.

*Edna B. Mine* (Quartz).—See our XIIth Report, p. 247. It is 3 miles S.E. of Shasta, at 850′ elevation. Since our last Report the tunnel has been extended to 325′ in length, and some stoping done. A steam arrastra, 8′ in diameter, with self-feeder and continuous discharge, crushing 4 tons in twenty-four hours and driven by a 10 H.P. engine, has been placed within 300′ of the tunnel mouth, and connected therewith by tramway. J. H. Beecher, of Anderson, owner.

*El Dorado and Eureka Mine* (Quartz).—See our XIIth Report, p. 247. It is near the Tower House, 3 miles S. of French Gulch, at about 3,000′ elevation, and comprises two claims. The principal vein trends N.W. and S.E. on the slate and porphyry contact. Another vein about 8′ distant, and entirely in the slate, varying from a seam to 2′ wide, pitches toward the other and carries a very high-grade ore. The developments

consist of a 150′ tunnel on the vein, giving 125′ of backs, and a 150′ cross-cut tunnel through the porphyry on the west side to the vein, giving 80′ of backs. There is an opportunity of cutting the vein at 1,000′ depth by starting a tunnel from the gulch. The pay-shoot has been traced 200′ at the east end of the claim, and is well mineralized, carrying high grade copper sulphides. Two men are employed. E. P. Conners, of Redding, owner.

*Emigrant Mine* (Quartz).—See our XIIth Report, p. 248. It is miles N. of Stella. C. A. Crowell, of Stella, owner.

*Empire Mine* (Quartz).—It is 13 miles N.W. from Ono, at 4,300′ elevation. The vein, from 6′ to 22′ wide, trends N. 30° W., and dips 55° N.E. between porphyry and slate walls. The quartz is well mineralized, and carries a large amount of ochre. The developments consist of a 140′ tunnel and a 45′ shaft with two cross-cut drifts, 12′ and 22′ long. Three men are employed. J. T. Lockhardt et al., of Ono, owners.

*Empire (Myers) Mine* (Quartz).—It is situated 5 miles W. of French Gulch, at 3,025′ elevation, and comprises three claims on an E. and W. vein lying very flat, near the contact of slate and porphyry, where the formation is greatly broken up, it having the appearance of having been crushed over. The trouble caused in timbering shows a constant heavy pressure being exerted to the south. There are four main tunnels, designated No. 3, No. 2, Hoskins, and Bell; they are 327′, 205′, 268′, and 115′ long respectively. The vein, 6′ wide in places, contains considerable clay and a comparatively low grade of ore, with 1½% sulphurets of good grade. The mill is an old 4-stamp steam-power mill, with 850-lb. stamps, crushing 3 tons per stamp through a No. 3 screen. The 8 H.P. engine consumes 1½ cords of wood per day. Eighteen men are employed. Empire Mining Co., of Salt Lake, Utah, owner; J. H. Morton, of French Gulch, superintendent.

*Enright Mine* (Quartz).—See Deakin & Taylor.

*Eureka Tellurium Mine* (Quartz)—It is near Middle Creek, 2½ miles W. of Redding, at 630′ elevation, and contains 292 acres. These ores carry quite a percentage of tellurium, and considerable difficulty has been encountered in beneficiating them. Since our last Report, a new process plant has been erected for handling them. The ore is drawn from the tunnel mouth up an incline tramway to the mill, where it is delivered to the rock-breaker and crushed to walnut size, and then dropped into a drying furnace, with an incline hearth, to remove all moisture. The furnace is 5′x 20′, with a hearth of iron plates, under which the products of combustion pass from the grate to the stack. The ore then is crushed dry, a 30-mesh screen being used, and elevated into an agitator, 8′ in diameter, where chemicals (a secret solution) are intimately mixed with the ore. The pulp is then passed into two rotating, egg-shaped iron barrels with hollow trunnions. These barrels are 3′x 4′ inside, and weigh 7,000 lbs. each; each contains 16 steel balls, 6″ in diameter. After being charged the barrels are rotated from 4 to 12 hours, according to the amount of tellurides contained, but more especially with reference to the amount of coarse gold; the coarser the gold the longer the time required. The pulp is finally emptied into a steam filter, 4′ in diameter, capable of holding 2 tons of pulp. The filter consists of 10-oz. duck spread over a wire gauze, through which the pulp is forced under 100 lbs. pressure of steam. The clear solution is passed into two 3′x 3′x 16′ precipitating vats, lined with galvanized iron, while

he residue (pulp) is discharged into a car beneath the filter and conveyed to the dump. The gold is precipitated from the solution by means of amalgamated aluminum plates suspended in the tanks, 10 in each tank, and, gathering in the bottom as a brown powder, is collected and melted in the usual way. It is claimed that 87% of the assay value of the ore is recovered. The power is furnished by a 50 H.P. engine supplied by a 100 H.P. and a 50 H.P. boiler. After precipitation the chemical solution is pumped back, restored to its original strength, and used over again. Cyanide of potassium and caustic soda form part of the solution. It requires 5 men to handle the mill. Peter J. Sherer et al., of Redding, owners.

*Extension Mine* (Quartz).—See Bowery Belle.

*Falls Mine* (Quartz).—See our XIIth Report, p. 248. It is 4 miles W. from Igo, at 2,150′ elevation. Since our last Report, 50′ of shaft and 30′ of tunnel have been excavated; this, with a little stoping, has kept the mill running part of the time. One man is at work. E. L. Ballow, of Igo, owner.

*Florida Mine* (Quartz).—See our XIIth Report, p. 248. It is situated 3 miles S. of Shasta. G. W. Boswell, of Shasta, owner.

*French Gulch* (*American*) *Mine* (Quartz).—It is 3¾ miles N.W. from French Gulch, at 2,550′ elevation, and embraces four claims or 320 acres, with veins bearing N.E. and varying from 4½′ to 7½′ in width, between porphyry and slate. There are several tunnels on the property; from the lowest one, a 600′ cross-cut, a drift extends 100′ eastward and shows a 4′ vein at the breast. Closed by litigation. An incorporated company, owner; — Richardson, of Redding, superintendent.

*Gage & Martin Mine* (Quartz).—It is 1½ miles S. from Shasta, at 1,000′ elevation, and comprises 80 acres. The 16″ vein trends E. and W., and dips 45° N., between slate and syenite. The developments consist of a 140′ tunnel on the vein and a 45′ incline. Two men are at work. Gage & Martin, of Redding, owners.

*G. A. R. Mine* (Quartz).—See McCarthy, Saeltzer & Smith.

*Gardiner Bros.' (Red Hill) Mine* (Hydraulic).—See our XIIth Report, p. 255. It is ½ mile N.E. from Ono, and contains 60 acres of hard, cemented river-wash. Since our last Report, the owners have cut a new ditch ¾ mile long, 30″ wide at bottom and with 1″ fall to the rod, from Eagle Creek. Its capacity is 500 inches, delivered under 170′ pressure. The company has thus secured free water for several months in the year; for the remainder of the season the Hardscrabble ditch furnishes water for 2½ cents per inch for twelve hours. The stone restraining dam was washed out last season by a cloudburst, and has been replaced by one large brush-and-log dam, 65′ long and 15′ high, and six smaller ones above it in Pan Gulch. The cut has been extended about 150′ in length and 50′ wide, showing granite bedrock to be pitching S.W. at an angle of 35°. Three men are at work. Gardiner Bros., of Ono, owners.

*Gladstone Mine* (Quartz).—See our XIIth Report, p. 248. It is 5 miles N.E. from French Gulch, at 2,325′ elevation, and includes nine claims. The mine has been closed nearly two years by litigation, and has only been recently reopened. Renewed legal troubles have once more closed it. While operating, the drain and the main Gladstone tunnel, 200′ above, were pushed ahead, employing forty-seven men. An incorporated company, of Cleveland, Ohio, owner; F. Brightman, of French Gulch, superintendent.

*Gold Bar Mine* (Quartz).—It is on the head of J. I. C. Gulch, 4 mil N.E. from French Gulch, at 3,000′ elevation, and comprises six claim The vein, averaging 3′ wide, trends N.E. and S.W., and dips 70° N between a porphyry hanging-wall and a slate foot-wall. The vein pro pects for a continuous distance of 2,000′ along the outcrop. The develo ments consist of several shafts, 8′ to 10′ deep, along the course of t vein, and a 240′ cross-cut tunnel, which needs extending 60′ to cut th vein; 80 acres of timber land belong to the property and free water ou of J. I. C. Gulch may be secured for part of the season. Five men ar employed. Ellis, Porter & Co., of French Gulch, owners.

*Gold Coin Mine* (Quartz).—See Salt Creek.

*Gold Hill Mine* (Quartz).—See Harrison Gulch. It lies at 3,74 elevation. There are two tunnels, 180′ apart; the upper one, 40′, an the lower one, 90′, are being driven ahead. Four men are at wor Fowler, Rhodes & Benton, of Middle Fork, owners.

*Gold Hunter Mine* (Quartz).—See Harrison Gulch.

*Gold Leaf Mine* (Quartz).—It is 3 miles N.W. from Redding, at 2,30 elevation. The vein varies from 1′ to 8′ in width, trends N.W. and S.E and dips 40° S.W., between diorite walls. The developments are a 9 shaft and a 224′ tunnel, in the wall rock, and two drifts therefrom i ore, 102′ and 41′ long. Two men are at work. W. P. Miller, of Middl Creek, owner.

*Golden Chariot Mine* (Quartz).—See Niagara.

*Gossan Mines* (Quartz).—They are 3 miles W. from Delta Station, a 3,600′ elevation, and consist of a group of locations, known as Nos. 1, 2 and 3, on a mineral outcrop 80′ wide, carrying copper, iron, gold, an silver. The trend is N.E. on a contact between slate on the W. and trachytic rock on the E. Only assessment work has been done Sanders & Brown, of Delta, owners.

*Grab Mine* (Quartz).—See Stowell.

*Gray Fox Mine* (Quartz).—See Harrison Gulch. It lies at 3,150 elevation. An ochre seam along the wall is rich in free gold. A cut 30 long has been made on the outcrop, and a tunnel, now 30′ long, is bein driven. A Kendall mill, just completed, is run by steam-power, an crushes 6 tons per day. Five men are employed. W. R. Conant et al. of Castella, owners.

*Green Mine* (Quartz).—See our XIIth Report, p. 249. It is 3½ mile W. from French Gulch, at 3,300′ elevation, and comprises three loca tions on a N. and S. vein. Since our last Report the lower tunnel ha been advanced 100′ and an upraise of 40′ made from the same; a 120 cross-cut tunnel near the summit of the ridge has also been made to th vein. Nine men are employed. — Kelley et al., of French Gulch owners.

*Grover Cleveland Mine* (Quartz).—See Harrison Gulch.

*Gypsy Gold and Silver Mine* (Quartz).—See our XIIth Report, p. 249. It is 2 miles S.W. of Shasta, at 750′ approximate elevation. J. B. Tim monds, of Redding, owner.

*Hall's Mine* (Quartz).—It is on the divide between Jerusalem and Cottonwood creeks, 10 miles N.W. of Ono, an 3,200′ elevation. The two locations on the 14″ vein trend N.E. and S.W., and dip S.E., between serpentine and slate. The vein carries considerable ochre and some copper sulphides. In October, 1895, there was a 15′ shaft, and a cross-

ıt was started to cut the ledge. Three men are at work. W. Hall and . Landers, of Ono, owners.

*Hardscrabble* (*Dry Creek Tunnel and Fluming Co.'s*) *Mine* (Hydrau- c).—See our XIIth Report, p. 249. It is ½ mile E. of Igo, and com- rises 1,700 acres. Being enjoined from working by the hydraulic rocess, several points on the face of the bank are being drifted by essees. Eight men are at work. Dry Creek Fluming and Tunnel Co., f San Francisco, owner; R. G. Harvey, of Igo, manager.

*Harrison Gulch Mines* (Quartz).—This group is situated in the south- est portion of Shasta County, near the Trinity and Tehama county ne, 55 miles due W. from Cottonwood, at 3,000′ to 3,600′ approximate levation, and consists of the following locations: *Bee-Gum*, *Black Bear*, *Eagle Bird*, *Gold Hill*, *Gold Hunter*, *Gray Eagle*, *Gray Fox*, *Grover Cleveland*, *Knob Hill*, *Lost Mine*, *Lucky Baldwin*, *Newtown*, *N.W. Exten- ion of Bee-Gum*, *N.W. Extension of Gold Hill*, *N.W. Extension of Lucky Baldwin*, *Red Fox*, *S.E. Extension of Lucky Baldwin*, and *Wilbur*. The hree principal veins were discovered in the summer of 1895 and are des- gnated the *Bee-Gum*, *Gold Hill*, and *Lucky Baldwin*. The veins gener- lly trend N.W. and S.E., and dip 60° N.E., in slate formation, near he contact with serpentine, and are about 400′ apart. The Bee-Gum lies .E. of the Gold Hill and Lucky Baldwin. The vein averages between ′ and 3′ in width. The quartz carries ochery matter, with but few sul- hurets near the surface, and yields well in free gold in the arrastra. he veins have been traced from Harrison Gulch, a feeder of the Middle ork of Cottonwood Creek, across the dividing ridge into Trinity County.

*Hartman Mine* (Quartz).—See our XIIth Report, p. 250. It is 3½ iles N. of Stella. W. Hartman, of Stella, owner.

*Hidden Treasure Mine* (Quartz).—See Niagara.

*Hidden Treasure Mine* (Quartz).—See our XIIth Report, p. 250. It s situated 8 miles N.E. of Shasta, on the Iron Mountain road. In itigation.

*Holman Mine* (Quartz).—It is near Flat Creek, 2 miles S.W. of Cop- ey, at 2,000′ elevation, and consists of two claims, on a N.W. and S.E. ein, 2′ wide, which dips 70° E., between porphyry walls. The quartz arries iron and copper pyrites, and is worked, through a 75′ cross-cut unnel to the vein and a 25′ incline, by one man. J. Holman, of Cop- ey, owner.

*Indiana Mine* (Quartz).—It is on Motion Creek, near Copley, at 1,150′ levation, and comprises four locations, designated the *Bay State*, *ndiana*, *Last Chance*, and *Sunrise*. The principal vein on the Last hance claim courses N.W. and dips about 60° N.E., with a width of ′, and is developed with a 20′ incline with short drifts on the vein. A econd 18″ vein on this claim trends E. and W., and has a 50′ shaft on he east end. On the Indiana claim are six small parallel E. and W. eins, dipping 50° N., opened by a cross-cut 135′ long, while a 20′ in- line on the south end of the Indiana proved a N. and S. vein, 10′ vide, dipping 10° E. The Bay State claim has merely a short, open ut. Two men are employed. P. N. Roan et al., of Copley, owners.

*Industry Mine* (Quartz).—See Bowery Belle.

*Iron Mask Mine* (Quartz).—See our XIIth Report, p. 250. It is 6½ niles from Stella, and comprises six claims. Mine and mill idle. S. W. Levy, of San Francisco, owner.

*Jackson Mine* (Quartz).—See Billy McCormick.

*Jay Eye See Mine* (Quartz).—See our XIIth Report, p. 250. It is miles N.E. from French Gulch, at 2,500′ elevation, and comprises sev eral claims. Three men are at work. Van Meter, Fox, et al., of Frenc Gulch, owners; J. Johnson, superintendent.

*Jeannette Mine* (Quartz).—See Crown Point Cons. G. M. Co.

*Jerusalem Mine* (Quartz).—It is in Sec. 9, T. 31 N., R. 8 W., o Bully Choop Mountain, at 5,350′ elevation. The vein is 30′ wide, trend N.W., and dips N.E., between slate and trachyte. Developments consis of two tunnels 40′ apart; the upper one is a 300′ cross-cut to the vein with a 65′ drift; the lower one is in 83′ on the vein. A 33′ air-shaft wil tap No. 1 tunnel. Two men are at work. J. T. Lockhardt, of Ono, owne

*Jerusalem Bar Mine* (Hydraulic).—It is on Jerusalem Creek, 9 mile W. of Ono, at about 3,000′ elevation, and comprises 30 acres of ground The cut is 50′x 75′ and the gravel is about 20′ deep, and carries man bowlders, which must be blasted. The gold is coarse, and mostly on th bedrock. Water is obtained from Jerusalem Creek through ½ mile c ditch, and delivered under 60′ pressure, through 200′ of 8″ pipe, to a No. giant. The tail-flume is 100′ long and 18″ wide, and paved with Hun garian and pole riffles. Three men are at work. J. Barnes and J. Moon of Ono, owners.

*Jim Fisk Mine* (Quartz).—See our XIIth Report, p. 251. It is 3 mile N. of Igo. Mill invented by owners. Mine and mill are idle. E. Jone and H. C. Christensen, of Igo, owners.

*Joe Davis Mine* (Quartz).—It is 11 miles W. of Ono, on Jerusalen Creek, at 4,500′ elevation. The vein, from 14″ to 18″ wide, trends N.W. and dips 60° E., in slate rock. A shaft has been sunk 35′ on the vein Two men do assessment work only. W. McCormick, of Ono, owner.

*Jumbo Mine* (Quartz).—See Salt Creek.

*Knob Hill Mine* (Quartz).—See Harrison Gulch. It lies at 3,500 elevation. A. J. Fowler and W. R. Conant, of Castella, owners.

*Last Chance Mine* (Quartz).—See Indiana.

*Lava Bed Mine* (Drift).—See our XIIth Report, p. 251. It is 5 mile S. of Redding, and comprises 40 acres on Oregon Gulch, in Sec. 15, T 31 N., R. 5 W. Idle. A. L. Parsons, of Redding, owner.

*Lem Jim* (*Tom White*) *Mine* (Drift and Hydraulic).—It is 1 mile W from Igo, at 2,500′ approximate elevation, and contains 45 acres. The gravel bank is worked in two benches, and the bedrock has not ye been reached; the cut is about 60′ deep and 250′ wide, in cemented gravel without any large bowlders, carrying but little gold, of a fine, scaly nature. The gravel worked last year realized about $700 only. Four Chinamen, during the dry season, drifted into the face of the bank below the second bench, and are in 40′. The company takes water from one of the Dry Creek Tunnel and Fluming Co.'s ditches, using, under 50 pressure, 300 inches when hydraulicking; at other times they use only 5 inches. There are 500′ of 18″, 15″, and 12″ pipe supplying water to one giant with 2½″ nozzle. The water season lasts 4½ months. The tail-flume of 72 boxes is 2½′ wide, set on a 2½″ grade, and paved with 6′ blocks. The tailings dump into Dry Creek behind four dams (one rock and three brush), 6′, 7′, and 9′ high and 150′ across. The seepage in the pit is removed by a Chinese pump driven by a 6′ overshot wheel. Fifteen Chinese at work during the season. A Chinese company, owner Lem Jim, of Igo, manager.

*Little Maud Mine* (Quartz).—It is 7 miles from Shasta, at the eastern ase of Iron Mountain, at 2,325′ elevation. The vein is about 2′ wide, ›urses N.E., and dips 45° N.W., between porphyritic and diorite walls. he quartz carries about 3% of high-grade copper sulphides. The evelopments consist of three cross-cut tunnels, 107′, 109′, and 295′ long spectively; the last two are connected by a winze, and No. 3 gives bout 195′ of backs. The pay-shoot is developed 55′ in length, and pitches . between walls giving evidence of heavy movement having taken lace. The ore is reduced in what is known as a Jones mill, patterned mewhat after a Huntington, only, in place of rollers, hammers strike ie outer peripheral ring-shaped die. The pan is 3½′ in diameter, and ie mill is run at a speed of 70 revolutions, crushing 6 tons in twenty-ur hours. Instead of aprons two cone-shaped amalgam traps receive ie pulp while being rapidly revolved within a stationary outer vessel. bout 90% of the amalgam is obtained in the mill and 10% in the traps. he entire machinery, including a Frue concentrator, is driven by a 12 I.P. steam engine. Water for the mill is obtained from the mine. ight men are employed. D. N. Haskell et al., of Redding, owners; . Murray, of Redding, manager.

*Live Oak Mine* (Quartz).—It is 4 miles N. of Redding, at 950′ eleva-on, and is an extension of the original Quartz Hill vein, trending N.W. nd S.E., dipping 60° N.E., in slate, and varying up to 10′ in width. wo shallow inclines show the vein to be 5′ to 8′ wide. Two men are at ork. W. T. Hyatt, of Buckeye, owner.

*Lodi Mine* (Quartz).—See our XIIth Report, p. 252. It is 4 miles W. f Igo. Idle. W. D. Bull, of Igo, owner.

*Lost Mine* (Quartz).—See Harrison Gulch. It lies at 3,100′ elevation. lar & Crawford, of Middle Fork, owners.

*Lost Buck Mine* (Quartz).—See our XIIth Report, p. 252. It is 6 miles .W. of Ono. Idle. H. Arkarro, of Ono, owner.

*Lucky Baldwin, S.W. Extension* (Quartz).—See Harrison Gulch. It ies at 3,100′ elevation. Two men are at work. J. Fowler and L. Rhodes, f Middle Fork, owners.

*McCarthy, Saeltzer & Smith* (*G. A. R.*) *Mine* (Quartz).—It is 4½ iles N.W. from Redding, at 975′ elevation. The 2′ vein courses N.W. nd S.E., and dips 60° N.E. between slate walls. The quartz carries 1% f high-grade sulphurets, with some telluride. It is opened by a 40′ ncline and a 30′ open cut connecting with a 40′ tunnel driven toward he incline, which has not yet been reached. Two men at work. IcCarthy, Saeltzer & Smith, of Redding, owners.

*Mad Mule Mine* (Quartz).—See our XIIth Report, p. 252. It is 5 iles N.W. of Stella, and comprises three claims. Since our last Report he tunnels have been extended and a new tunnel started. Four men re at work. Elleigh & Rea, of Stella, owners.

*Mad Ox Mine* (Quartz).—See our XIIth Report, p. 252. It is 5 miles . of Stella. Idle. L. Reil and J. W. Woodward, of Stella, owners.

*Mammoth Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 568 nd 252. It is 8½ miles N. of Redding. Idle. S. Cheney, of Philadel-hia, Pa., owner.

*Mammoth Mine* (Quartz).—This is a prospect on the road between Kennett and Copley. The vein trends N. and S., and dips E. The quartz carries a very large percentage of extremely fine iron sulphides. Idle. Frank Kenyon et al., owners.

*Manlove Mine* (Quartz).—See our XIIth Report, p. 252. It is 3 miles N. of Stella. Idle. J. E. Manlove, of Perkins, Sacramento County, owner.

*Manzanita Mine* (Quartz).—See Diamond.

*Mascot Mine* (Quartz).—See our XIIth Report, p. 252. It is 2 miles W. of Shasta. Idle. W. Herron, of Redding, owner.

*Mechado Mine* (Quartz).—See our XIIth Report, p. 252. It is 3 miles N.E. of Igo. Idle. — Mechado, of Igo, owner.

*Minnehaha Mine* (Quartz).—See Bowery Belle.

*Midnight Mine* (Quartz).—See Crown Point Cons.

*Miner's Dream Mine* (Quartz).—See our XIIth Report, p. 252. It is 3½ miles S. of Shasta. W. A. Boswell, of Shasta, owner.

*Midwinter Mine* (Quartz).—It is 2½ miles N.E. from Redding, at 570 elevation. The heavy sulphuretted vein, about 4′ wide, courses N.E. and dips 50° W., between slate and porphyry, with a gouge of red clay from 8″ to 10″ wide. The developments consist of an incline, 32′ deep on the vein. Two men are at work. T. Harrison, H. B. Jackson, and J. Booth, of Buckeye, owners.

*Moline Mine* (Quartz and Placer).—It is 3 miles N. of Shasta, and contains five claims, including quartz veins and a placer, at 1,175′ elevation. The veins have a general N.E. course and dip 45° S.E., along a contact of porphyry and quartzite, averaging 30″ in width. Developments consist of an open cut, 40′ long, on the croppings; a 60′ cross-cut tunnel to the vein, and a 10′ incline; the tunnel gives 25′ of backs. At the depth attained the quartz is mixed considerably with clay. It is provided with a 10′ arrastra run by an 18′ overshot wheel with 22′ breast, which crushes one ton per day; the water is derived from the north branch of South Fork of Spring Creek, through 300′ of ditch of 180 miner's inches capacity. The placer claim is below the arrastra on a former bench of Spring Creek. The gravel is 5′ to 6′ deep, filled with large bowlders occupying a narrow channel, and requiring the use of a hand derrick with 26′ mast and 22′ boom. The water season lasts five months. The tail-flume is paved with rocks, and set on a 9″ grade. A clean-up is made once in a season. Two men are employed. Mrs. Moline, of Shasta, owner.

*Mountain Mine* (Quartz).—See Alvina.

*Mountain Top Mine* (Quartz).—It is 5 miles W. from Redding, at 750′ elevation. The 7′ to 10′ vein trends N. and S., and dips E., between syenite and diorite walls. A 70′ tunnel has been run on the vein. Two men are at work. J. W. Copeland, of Redding, owner.

*Murray Mine* (Quartz).—See our XIIth Report, p. 253. It is 2½ miles S.W. of Copley. Idle. Barney Conroy, of Redding, owner.

*Myers Mine* (Quartz).—See Empire.

*Nelson Gold Mine* (Quartz).—See our XIIth Report, p. 253. It is on Grizzly Gulch, 7 miles N. of Stella. Idle. C. A. Nelson, of Stella, owner.

*Newtown Mine* (Quartz).—See Harrison Gulch. It lies at 3,100′ elevation. Rhodes, Benton & Co., of Middle Fork, owners.

*New Year and Australian Mine* (Quartz).—It is 1½ miles N. of Shasta, at 1,050′ elevation, and comprises two claims. The New Year vein courses E. and W. in porphyritic granite, and has a 50′ incline and 25′ drift on the 5′ vein carrying 1% of high-grade sulphurets. The Aus-

alian is a 5′ vein running N. and S. Two men are at work. Cunningam & Garrechty, of Shasta, owners.

*Niagara Mine* (Quartz).—See our Xth and XIIth Reports, pp. 636 ad 253. It is 5 miles W. from French Gulch, at 2,810′ elevation. The ompany have leased several of their twenty-two claims. Two of the aims, known as the *Hidden Treasure* and *Golden Chariot*, are leased to . H. Chynotteth, of Shasta, who is opening a 3′ sulphuret vein. Halday & Fox, lessees, are driving a tunnel on the *Scorpion* to get into me old workings known to contain rich seams. The *Summit* is being xploited by two lessees, on 75% basis. At time of our last Report, the ay-shoot in the Niagara Mine proper had been cut off by a cross dike neader), all the pay being on the east side; in crossing this header, to e W. and 25′ below, a large body of pay-ore has been opened out. ater, through an error of 22′ to the north, in surveying for a connecon of this portion of the mine with an upraise from the lowest, or 'Neil, tunnel, a hitherto unknown body of ore, 8′ wide, has been ncovered. The pay-ore on the west of the header has a porphyritic ppearance, is strongly mineralized, and carries quite an amount of me. The mill was not running, but was to be started soon. Forty-ve men are at work. An incorporated company, of New York, owner; . E. Hanley, of French Gulch, superintendent.

*North Hope Mine* (Quartz).—See Diamond.

*N.W. Extension of Bee-Gum Mine* (Quartz).—See Harrison Gulch.

*N.W. Extension of Gold Hill Mine* (Quartz).—See Harrison Gulch.

*N.W. Extension of Lucky Baldwin Mine* (Quartz).—See Harrison ulch.

*Original Gravel Mine* (Drift).—See our XIIth Report, p. 254. Abanoned.

*Original Quartz Hill Mine* (Quartz).—See our XIIth Report, p. 254. ee Consolidated Kosciusko.

*Old Spanish Mine* (Quartz).—See Deakin & Taylor.

*Phœnix Mine* (Quartz).—See Salt Creek.

*Potosi Mine* (Quartz).—See our XIIth Report, p. 254. It is 12 miles .W. of Redding. Idle. Senator J. P. Jones, of Gold Hill, Nev., owner.

*Pugh & Lindsay Mine* (Quartz).—See our XIIth Report, p. 254. It is n Clear Creek, 3 miles W. of Shasta. — Pugh et al., of Shasta, owners.

*Quail Mine* (Quartz).—See Alvina.

*Rattler* (*Minnesota*) *Mine* (Quartz).—See our Xth and XIIth Reports, p. 635 and 255. It is 3½ miles W. of Copley. Idle. Parmelee Ore Concentrating Co., of Chicago, Ill., owner.

*Red Cloud Mine* (Quartz).—See our XIIth Report, p. 255. It is 4 miles W. of Igo. Idle. — Hubbard et al., of Igo, owners.

*Red Fox Mine* (Quartz).—See Harrison Gulch. It lies at 3,150′ levation. W. R. Conant, of Castella, A. J. Fowler, of Middle Fork, et l., owners.

*Red Bluff Mine* (Quartz).—It is 15½ miles N.W. of Ono, at 5,500′ levation. It lies N.E. of and adjoins the Cleveland Consolidated Mine, he same vein passing through both claims. The vein is from 6′ to 8′ vide, between slate and trachyte walls. The developments consist of hree tunnels, 150′, 60′, and 30′ long, and a short winze on the vein. Two men do assessment work. Murray Estate, of Ono, owner.

*Red Hill Mine* (Hydraulic).—See XIIth Report, p. 255. See Garliner Bros.

*Remonia* (*Colorado, D. & B.*) *Mine* (Quartz).—See our XIIth Repo p. 256. See Colorado Mine. It is 4 miles S.W. of Redding. Idle.

*Richmond Mine* (Quartz).—See our XIIth Report, p. 256. It is miles W. of Igo. Idle. J. B. Wright, of Igo, owner.

*Rickard Mine* (Quartz).—It is 5½ miles W. of Delta, at 2,300′ elev tion, and comprises two claims. The vein courses E. and W., and di about 60° S., in a porphyritic rock, and carries 4½% of sulphure The gangue consists partly of feldspar. A 240′ tunnel starts from t bank of Dog Creek, just above high-water level, disclosing a 5′ vei Idle at present. Two men work the mine. — Rickard, of Delta, owne

*Sacramento Pliocene Mine* (Drift).—See our XIIth Report, p. 256. is in Sec. 15, T. 31 N., R. 5 W., in Oregon Gulch, 5 miles S.W. Redding. Idle. Dr. L. A. McLane, of Sacramento, owner.

*Salt Creek Mines* (Quartz).—See our XIIth Report, p. 256. Th group is 4 miles W. of Redding, at 450′ elevation, and comprises t *Bonanza*, *Corinne*, *Gold Coin*, *Jumbo*, and *Phœnix*. Since our la Report an arrastra, 10′ in diameter and continuous discharge, has bee built. It is run by water-power obtained from Salt and Flat creek through a ditch 1 mile in length, 2′ wide on top, 1½′ deep, with ¼′ grad per rod. The season lasts eight months. A 50′ tunnel on the east en and an 80′ tunnel farther west, on the Bonanza claim, have been drive Four men are at work. E. P. Conner, of Redding, owner.

*Sanders & Vollmar Mine* (Quartz).—It is 5½ miles W. of Delta, o Dog Creek, at 225′ elevation at lower level. Two parallel veins, about wide and heavily sulphuretted, course E. and W., and dip 60° S., betwee porphyry walls, with a gouge on the foot-wall. Three tunnels, 40′, 150 and 100′ long, have been driven from the banks of Dog Creek. One ma is at work. — Vollmar, of Trinity Center, and — Sanders, of Delt owners.

*Santa Rosa Mine* (Quartz).—See Bullard & Vandever.

*Scottish Chief Mine* (Quartz).—See Bullard & Vandever.

*Schuyler Mine* (Drift and Hydraulic).—See our XIIth Report, p. 25 It is ¾ mile from Igo. Idle. A Chinese company, owner.

*Scorpion Mine* (Quartz).—See Niagara.

*Shasta Mine* (Quartz).—See Annie.

*Slatonas Mine* (Quartz).—It is on McCall ranch, 4 miles W. of Delta at 2,100′ elevation, and comprises two claims on a 2′ vein carrying high grade sulphurets, trending N. and S., and dipping 80° E., on the contac between slate and syenite. The vein is developed through three tunnels 30′, 100′, and 256′ long; the latter is a cross-cut for 106′, and furnishin 108′ of backs. Two men are at work. Bard & Hunter, of Delta, owners

*Snider Mine* (Quartz).—See Clipper and Snider.

*South Mine* (Quartz).—See Deakin & Taylor.

*S.E. Extension of Lucky Baldwin Mine* (Quartz).—See Harrison Gulch

*Spanish Mine* (Quartz).—See Deakin & Taylor.

*Spardy Mine* (Quartz).—See our XIIth Report, p. 257. It is on Fla Creek, 2½ miles S.W. of Copeley. Barney Conroy, of Redding, owner.

*Spellman Mine* (Quartz).—See our XIIth Report, p. 257. It is 3 mile S.W. of Copley. J. S. Spellman et al., owners.

*Spring Gulch Mine* (Quartz).—See our XIIth Report, p. 257. It i 7½ miles N.W. from Stella. L. Reil et al., of Stella, owners.

*Stowell* (*Grab*) *Mine* (Quartz).—It is 7 miles, by trail, S.W. from Copley, facing Spring Creek, at 3,100′ elevation at the main tunnel,

nd comprises seven claims. The formation and trend are identical ith the ore-bodies of the Iron Mountain Mine, of which it is a con- nuation. There is a 40′ tunnel, besides some cuts and openings. One an is at work. J. H. Stowell, of Copley, owner.

*Sugar Loaf Mine* (Quartz).—See our XIIth Report, p. 257. It is 4 iles W. of Redding. Idle. E. D. Hendricks et al., of Redding, wners.

*Summit Mine* (Quartz).—See Niagara.

*Summit Mine* (Quartz).—It is 7 miles from Ono, at 4,500′ approxi- ate elevation. The vein, 1′ to 4′ wide, trends N.W. and S.E., and dips .E., between porphyry and slate, carrying large quantities of ochery e of a high grade. There are three tunnels on the vein, and it is ntended to start a lower one.

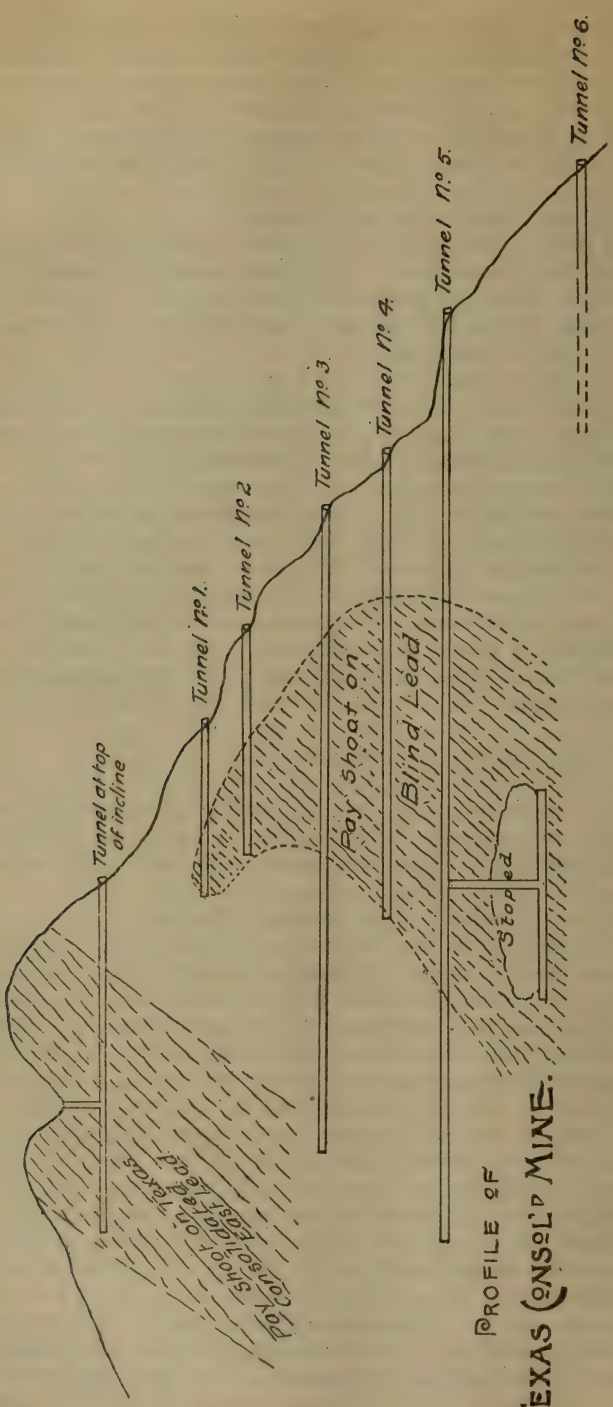
*Summit Mines* (Quartz).—They are 5 miles W. of French Gulch, at ,500′ elevation, and comprise five locations on two systems of veins; ne trending E. and W., with the general course of the mineral belt of his section, and dipping N.; the other trending N. and S., and dipping 5° E. The formation is porphyry and slate. The width of the veins aries from a few inches to 3′. The developments on the E. and W. veins onsist of a 100′ shaft, showing a 6″ vein, tapped at 50′ by a cross-cut 02′ long; on another claim is a 120′ cross-cut and drifts 100′ E. on the vein; n a third vein is a 100′ incline shaft, tapped by a 230′ cross-cut. The . and S. vein is the same as developed on the adjoining (Tom Green) laim, from where it has been followed. For five months in the year nough water from Summit Creek is available for a 5-stamp mill. Two ssees are at work. F. W. Wheeler and Mrs. Morrell, of French Gulch, wners.

*Sunrise Mine* (Quartz).—See Indiana.

*Sunny Hill* (*Gray Eagle*) *Mine* (Quartz).—See our XIIth Report, p. 57. It is 7 miles W. from Ono, at 4,500′ approximate elevation. The ein, 1′ to 4′ wide, trends N.W. and S.E., and dips vertically, between late and porphyry. There are two tunnels and a 80′ winze. Loomis harpe and W. Hall, of Ono, owners.

*Taylor Mine* (Quartz).—See Deakin & Taylor.

*Texas Consolidated Mine* (Quartz).—See our Xth and XIIth Reports, p. 629 and 258. It is at Dry Diggings, at 1,180′ elevation, and com- rises 519 acres. Since our last Report tunnel No. 5 has been extended nder the hill to a total length of 1,600′, and a vertical shaft sunk 162′ elow its level, from which an intermediate drift has been opened and topes started 200′ on the one side and 160′ on the other, opening up a ery fine body of ore, 17′ wide in places. A lower tunnel, No. 6, which as just been started, will connect with this shaft at a depth of 225′; he tunnel will be driven by machine drills. The ore for the mill is aken from the sinking of the shaft and from above No. 4 tunnel, and s conveyed to the mill by rope tramway 2 miles in length, which will e abandoned on completion of tunnel No. 6, when a 4,000′ tramway vill connect the tunnel and mill. The ore-shoot on No. 5 is 600′ long, nd pitches into the hill. A chlorination plant, of 2¼ tons capacity per lay, has been added. The bullion yield shows a working result of 92%. The sulphuret yield is 1¼ tons per day, and the concentrates from the anvas plant furnish 6 tons per month. The entire plant will shortly be supplied with electric light. Water used in the mill is pumped from


Tunnel No. 6.
Tunnel No. 5.
Tunnel No. 4.
Tunnel No. 3.
Tunnel No. 2.
Tunnel No. 1.
Tunnel at top of incline
Blind Lead
Pay shoot on
Stoped
Stoped
Pay shoot on Blind Lead
Shoot on Blind Lead
PROFILE OF
TEXAS CONSOL'D MINE.

Uncle Sam Mine and Mill.

he Sacramento River. Seventy-five men are employed. An incorpo-ated company, owner; R. G. Hart, president and manager.

*Thompson Mine* (Quartz).—See our XIth and XIIth Reports, pp. 40 nd 258. It is 2½ miles S.W. of Shasta. Idle. — Thompson, of Shasta, wner.

*Three Sisters Mine* (Quartz).—It is in Dutch Gulch, 2 miles N.W. rom French Gulch, at 2,150′ elevation, and comprises four claims. The ein, varying in width from a few inches to 2′, trends E. and W., and lips 60° N., between slate and porphyry walls. Drifts have been run n the vein from both sides of the gulch, 200′ on the east and 110′ on he west. The vein, which was only discovered last summer, carries galena and shows free gold. The mill consists of a Dodge rock-breaker nd a 3½′ Huntington roller-mill with self-feeder, crushing 5½ tons in welve hours; all driven by a 12 H.P. engine. A canvas plant, 30′x 6′, s below the mill. Nine men are at work. E. Ellery & Bros., of French Gulch, owners.

*Topknot Mine* (Quartz).—It is 5½ miles from Delta, at 2,400′ eleva-ion, and comprises three claims, on three parallel E. and W. veins, averaging 2½′ in width, in grano-diorite. Two tunnels have been driven, he lower one, a 45′ cross-cut, gives 60′ of backs, and the upper one runs 100′ on the vein. A little stoping has been done. A 9′ arrastra, driven by a 16′ overshot wheel with 34″ breast, crushes 700 lbs. at a charge. The water is taken from Dog Creek through 250′ of ditch. The sulphu-rets are saved on 15′ of carpet 25″ wide, and 12′ of canvas 5′ wide, furnishing about 1 ton of concentrates per month. Two men are at work. Neley Thomas, of Delta, owner.

*Tom White Mine* (Drift and Hydraulic).—See Lem Jim.

*Trinity Consolidated Mine* (Quartz).—It is 6 miles W. from Delta, at 2,575′ elevation, and comprises five claims, designated *Last Chance*, *Sitting Bull*, *Stonewall*, *Tehama*, and *Trinity*. The Last Chance, Sitting Bull, and Trinity trend N. and S., and the other two nearly E. and W. The developments are largely confined to the Trinity claim, which dips about 80° E., with an average width of 2½′ between slate and trachyte walls. The quartz carries a fair percentage of iron and copper sulphides. The other developments consist of tunnels driven on the ledge on both sides of the creek, one 80′ on the south, the other on the north; near the mouth of the tunnel is an 80′ perpendicular shaft, with a whip hoist and a pump driven by a 12′ overshot wheel. A 50′ winze in the north tunnel shows a well-mineralized vein 4′ wide. The ore is trammed 1,000′ to the 10-stamp mill, furnished with steam and water power, situated on the bank of the creek. There are two 6′ Frue concentrators and six electric slime-settlers; also, a 210-volt dynamo, furnishing fifteen lights. The capacity of the mill is 2 tons per stamp. Water-power is furnished from Dog Creek, through ½ mile of ditch of 300 miner's inches capacity, delivered under 120′ head, through 150′ of 9″ pipe, on a 5′ wheel. The water season lasts seven months. Fourteen men are employed. An incorporated company, of Red Bluff, Tehama County, owner; A. Vestal, of Bayles, superintendent.

*Uncle Sam Mine* (Quartz).—See our Xth and XIIth Reports, pp. 639 and 258. It is 7 miles W. from Kennett, at 2,300′ elevation, and comprises seven mining claims and sections of timber land. There are three main pay-shoots, designated the *East*, *Middle*, and *West;* present explorations indicate the probability of a fourth one. Since our last Report,

5 stamps have been added to the mill. The cost of maintenance at th mine is extremely heavy, on account of the very precipitous and rugg nature of the country. Timbers and wood have to be shot down to t required points. Eighty men are employed. Sierra Buttes Gold Mini Co. (Ltd.), owner; S. J. Johns, of Kennett, superintendent.

*Utah and California Gold Mine* (Quartz).—See our Xth and XII Reports, pp. 630 and 259. It is 7 miles N.E. of Redding. Idle. Walk Bros., of Salt Lake, Utah, owners.

*Vandever & Bullard Mine* (Quartz).—See our XIIth Report, p. 25 It is 2½ miles S.W. of Copley. Idle. Vandever & Bullard, of Cople owners.

*Washington Mine* (Quartz).—See our Xth, XIth, and XIIth Report pp. 635, 50, and 260. It is 4 miles N.W. from French Gulch, at 2,50 elevation, and comprises 82 acres. The property has lately change owners, who are fixing up the mine and mill for work. Twenty-fou men are employed. M. J. Luthers, of Streator, Ill., owner.

*West End Mine* (Quartz).—See our XIIth Report, p. 260. It is 1 mi S. of Stella. Idle. D. B. Hunt et al., of Stella, owners.

*West Point Mine* (Quartz).—See our XIIth Report, p. 260. It is 3 miles from Shasta. G. W. Boswell, of Shasta, owner.

*World's Fair Mine* (Quartz).—See our XIIth Report, p. 260. It is 2 miles N.W. of Igo. John Doeblein, of Redding, owner.

*Wilbur Mine* (Quartz).—See Harrison Gulch. It lies at 3,100′ eleva tion. Mrs. Cora Conant, owner.

*Yankee Blade Mine* (Quartz).—See Bowery Belle.

*Yellow Jacket Mine* (Quartz).—See our XIIth Report, p. 260. It is miles N.E. of Copley. W. Emerson et al., of Copley, owners.

## MILLS IN SHASTA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| American | Water | 5 | 750 | | | | | | | |
| Black and Brown Bear | | 10 | 850 | 20 | | | | | | |
| Calumet | Water | 24 | 600 | 48 | | | | | | |
| Chicago | Steam | 5 | | | | | | | | |
| Celestine | Water | 5 | 850 | 12½ | | | | | | |
| Clipper and Snider | Steam | 10 | 900 | 17½ | 2 | Frue | | | | 600 sq. ft. |
| Consolidated Kosciusko | Water | 20 | 850 | 18–25 | 4 | Frue | | | | 367 sq. ft. |
| Empire | | 4 | 850 | 12 | | | | | | 192 sq. ft. |
| Eureka Tellurium | S. & W. | 10 | 850 | 15 | | | | 4 tons. | | |
| French Gulch | Steam | 10 | 800 | | | | | | | |
| Gem Consolidated | Steam | 10 | 870 | 20 | | | | | | |
| Gladstone | S. & W. | 20 | 800 | 46 | 4 | Frue | 1 | 1½ tons. | | |
| Green | Steam | 5 | 850 | 9 | 1 | | | | | |
| Iron Mask | Water | 5 | | | | | | | | |
| Lost Confidence | Steam | 20 | 950 | 40 | | | | | | |
| Majara | Steam | 10<br>8 | 850<br>600 | 27 | | | | | | |
| Niagara | | 18 | 750 | | | | | | | |
| Reilly & Bliss | Water | 10 | 850 | 15–20 | | | | | | |
| Summit | Water | 5 | | | | | | | | |
| Sunny Hill* | Water | 5 | 750 | | | | | | | |
| Texas Consolidated | Water | 20 | 850 | 40 | 8 | Triumph | 1 | 2½ tons. | | 1,313 sq. ft. |
| Trinity Consolidated | Water | 10 | 850 | | 2 | Frue | | | | 60 sq. ft. |
| Uncle Sam | Water | 35 | 850 | 75 | 14 | Frue & Triumph | | | | 1,200 sq. ft. |
| Washington | | 10 | 650 | 20 | | | | | | 576 sq. ft. |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SHASTA COUNTY.

| Name of Mill or Mine. | Power. | Number | Character. | Diameter | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Bullard & Vandever | Steam | 1 | Huntington | 3½′ | 4 | | | | | | 7 sec., 22 ft. |
| Central | Steam | 2 | Huntington | | 23 | | | | | | |
| Delta | Water | | Arrastra | 12′ | 1½ | | | (Carpet plant | | 1,152 sq. ft.) | |
| Edna B. | Steam | | Arrastra | 8′ | 4 | | | | | | |
| Falls Gold | Steam | | Tustin Pulverizer | | 4 | 1 | McGrew | 1 | 1 ton. | | |
| Gray Fox | Steam | | Kendall R'ker | | 6 | | | | | | |
| Little Maud | Steam | | Rotary | | 6 | 1 | Frue | | | | |
| Molin | Water | | Arrastra | 10′ | 1 | | | | | | |
| Pugh & Lindsay | Water | | Kendall Mill | | | | | | | | |
| Salt Creek | Water | | Arrastra | | 2 | | | | | | |
| Sunny Hill | | 1 | Huntington | 5′ | | | | | | | |
| Three Sisters | Steam | 1 | Huntington | 3½′ | 5½ | | | | | | 180 sq. ft. |
| Topknot | Water | | Arrastra | 9′ | 7/20 | | | | | | 60 sq. ft. |

## Sierra County.

*Adelaide Mine* (Quartz).—It is on Howard Creek, near the base of Haskell's Peak, 9 miles N.E. from Sierra City, at 6,800′ elevation, and comprises three locations. Since our last Report the tunnels have been extended along the contact vein. Two men are at work. An incorporated company, owner; H. H. Bates, of Sierra City, superintendent.

*Alaska Mine* (Quartz).—See our VIth (Part II) and XIIth Reports, pp. 58 and 261. It is ¼ mile N.E. from Pike City, at 3,800′ elevation, and comprises four claims. Has changed owners and is temporarily idle. An incorporated company, owner.

*Alturas Mine* (Placer).—See our XIth and XIIth Reports, pp. 332 and 261. It is 3 miles N.E. from La Porte, at 4,000′ elevation, and comprises 5 miles of the Slate Creek channel. Twenty-five men are employed. C. Handel and — Packer, of La Porte, Plumas County, owners.

*American Exchange Mine* (Quartz).—It is 9 miles N.W. from Sierra City, at 6,400′ elevation, and comprises three locations—two quartz and one placer. One vein, 18″ to 3½′ wide, trends N. 80° E., and the other, 3′ wide, trends N., between porphyritic walls. The developments are made through a 5′x10′ double-compartment shaft, 80′ deep, tapped near the bottom by an adit 300′ in length; a 40′ drift has been run E. from the shaft, and shows a 3′ vein in the breast. A 4-stamp steam-power mill is in course of erection, using a 15 H.P. engine. Water-power for the mill might be used four to five months in the year. Three men are employed. G. Morrison, of Sierra City, owner.

*Atom Mine* (Quartz).—See our XIIth Report, p. 261.

*Bald Mountain Extension Mine* (Drift).—See our VIIIth, XIth, and XIIth Reports, pp. 580, 408, and 261. It is 2½ miles E. of Forest City, at 4,300′ elevation, and comprises 1,600 acres. Since our last Report the work has been progressing down the channel toward Forest City. The gasoline-engine at the head of the incline hitherto used for hoisting and pumping has been replaced by a 10 H.P. electric motor, actuated by a 17 H.P. dynamo on the outside. This motor hoists and pumps from 175′ on the slope or 60′ perpendicularly, using a 5″ Challenge pump with 3″ discharge pipe. Fifteen incandescent lights of 16 candle-power, 5 on a circuit, are supplied underground, and 20 on the outside. The main wire is ⅜″ rubber insulated, 2½ miles long, while ¼″ wire is used for the branch connections. The dynamo is run by an 18 H.P. steam-engine. Since 1894 about 1,000′ of the channel has been worked. It is said the average in September, 1895, was $6 per carload of 2,500 lbs. Forty men are employed. An incorporated company, of Downieville, owner; J. A. McDougall, of Forest City, superintendent.

*Bigelow Mine* (Quartz).—See our XIth and XIIth Reports, pp. 413 and 262. It is ¼ mile N.W. of Sierra City, at 4,400′ elevation. It is on an extension of one of the Sierra Buttes veins. Idle. Mrs. Bigelow, of Sierra City, owner.

*Bonanza* (*Mountain*) *Mine* (Quartz).—It is on the Sierra Butte, 3 miles N.E. from Sierra City, at 7,500′ elevation, and comprises two claims, besides some placer ground. The vein, varying from 8″ to 8′ in width, trends N.W. and S.E., and dips 45° E., between greenstone and slate walls. It is developed by three tunnels, the two upper ones passing entirely through the ridge; the uppermost, or No. 1, is 800′; No. 2,

1,600′, and No. 3, 1,200′ long, and No. 1 is 200′ below the croppings a 125′ above No. 2, which is 200′ above No. 3. All three tunnels are co nected by upraises. The ore is conveyed to the 40-stamp water-pow mill near the Yuba River by a wire-rope gravity tramway, 6,000′ lon carrying buckets of 400 lbs. capacity; 125 tons per day can be deliver to the mill. The stamps weigh 850 lbs. and crush 1¾ to 2 tons each p day through a No. 50 burr punched screen. The mill is run by a 4′ Pe ton wheel, with water obtained from Sardine Creek and the Yuba Rive through ¾ mile of ditch and flume, and delivered under 235′ head. Th expense for mining, tramming, and milling averages $2 per ton. Fift five men are employed; temporarily closed by litigation. An inco porated company, owner; A. G. Smith, manager.

*Brandy City Mining Co.'s Mine* (Hydraulic).—See our XIIth Repo p. 262. It is in Brandy City, at 3,700′ elevation. Since 1894 the ditch flumes, and restraining dams have been restored, and washing h commenced; the season lasts three to four months. The 1,000 inches water from Sailor's Ravine and Cherokee Creek is brought through 4-mile ditch, 4′ on top, 3′ on bottom, and delivered under 150′ pressur The depth to bedrock is 238′, but cannot be reached because of lack grade. The mile-long tail-flume passes through a 300′ tunnel wit about 18′ of dump. A brush dam, 400′ long, 40′ wide on bottom an 14′ high, holds the debris in the worked-out pit. Fifteen men a employed in the season. Allenberg & Goldstein, of San Francisc owners; J. Redington, of Brandy City, superintendent.

*Bruckerman Mine* (Drift and Placer).—It is in Studhorse Cañon ¾ mile N.W. from Poker Flat, at 5,500′ elevation, and comprises 8 acres. The channel courses N.E. and S.W. There are open cuts i the gravel, worked by ground-sluice, and a 200′ tunnel in bedroc partially exposing the gravel. Snow-water alone is available. Tw men are at work. F. Bruckerman, of Poker Flat, owner.

*Bullion and El Dorado* (*Fessler*) *Mine* (Quartz).—See our XIth an XIIth Reports, pp. 407 and 262. It is on Kanaka Creek at the mout of Steamboat Ravine, and 1½ miles S. from Alleghany, at 4,450′ eleva tion, and consists of the *Bullion* 1,000′x 400′, the *El Dorado* 1,400′x 600 and extensions on both, as well as a fractional claim. Two paralle veins, the Bullion and El Dorado, are 400′ apart, trend S. 80° E., an dip 45° to 60° N.E., between slate walls; the former averaging 5′ an the latter 2½′ in width. There are serpentine belts on both sides of th slate belt, and the veins show the marked presence of mariposite, whic is taken as a favorable indication of mineralization of the veins for thi district. Other quartz croppings show on the surface between the tw ledges, which are, however, probably breakages from the Bullion out crop. The two main veins appear on the surface to unite both E. an W. The El Dorado carries a milk-white quartz, with arsenical pyrite scattered singly through it next to the hanging-wall. At frequent inter vals pockets of gold have been met, enabling the owners to make profit by hand-mortaring the quartz. The Bullion vein carries a mor glassy quartz, of a crystalline texture, carrying copper sulphide alon the foot-wall side of the vein. Both veins evidence considerable move ment by striation marks and the shattering of the quartz in the vein as well as polished quartz surface. On the Bullion is a 100′ tunnel with a small stope, at 4,265′ elevation; 80′ below is a second tunnel. Th workings at present are confined to the El Dorado, on which are tw

ain tunnels along the vein, 360′ and 320′ in length, connected by a ravity incline tramway, 600′ long from the lower one to the mill. The round between the two tunnels is nearly untouched, but is furnishing art of the present supply of milling ore, the rest coming from the large ope above No. 1. A new 10-stamp water-power mill, crushing 14 tons aily, is situated on the bank of the South Fork of Kanaka Creek, and as 750-lb. stamps, 12′ of apron-plates, and two Johnston concentrators; he latter are not in use. Water, 200 inches, is brought from the creek hrough 4,000′ of ditch and flume, mostly the latter, 14″x 18″, and set n ½″ to 12′ grade. The water is delivered to a 4′ Pelton wheel under 20′ pressure. Ten men are employed. Mrs. Fessler, the Fessler heirs, nd Mr. Lewis, of Alleghany, owners.

*Bull of the Woods Mine* (Quartz).—It is 11 miles N. from Sierra City, t 7,100′ elevation, and comprises two claims on a contact trending .W. The workings have failed to develop any more than a mass of lay and quartz mixed, without any definite walls. There is a 4′ luntington mill, using steam-power. Idle. Four men are prospect- ng. M. B. Sheaver, of San Francisco, and — Knickren, of Mohawk, lumas County, owners.

*Bunker Hill Mine* (Drift).—See our XIIth Report, p. 263. It is situ- ted 4 miles N.E. from Gibsonville, at about 4,450′ elevation. D. onlan and W. Metcalf, of Nelson Point, Plumas County, owners.

*Butcher Ranch Mine* (Quartz).—It is 10 miles N. of Sierra City, at ,500′ elevation. The 6′ vein trends N. and S., between slate and por- hyry. A 12-stamp water-power mill is ½ mile distant. Idle. J. Van lyte, of Downieville, owner.

*Buttes Saddle Quartz Co.'s Mines* (Quartz).—They are situated near he crest of the Sierra Buttes Ridge, 2 miles from Sierra City, at 8,000′ levation, and comprise two full claims. The vein courses E. and W., nd dips about 50° N., between porphyritic walls, with a gouge on the oot-wall. The vein is 4′ to 5′ wide and carries high-grade sulphurets. A 1,200′ tunnel, run on the vein, gives at the breast 250′ of backs; there s an upper tunnel 200′ in length. A 75′ shaft has been sunk below he main tunnel. The ore is carried to the mill in buckets of 400 bs. capacity on a 6,000′ gravity wire tramway of two sections, the ransfer station being about midway. Considerable stoping has been one. The 10-stamp water-power mill, with 750-lb. stamps dropping 80 imes per minute, with 6½″ drop and 7″ discharge through No. 8 slot- ut screens, crushes 13 tons per day; the tailings are saved for future vorking. The water, 18 miner's inches, is bought by monthly contract rom the Sierra Buttes flume, and delivered to a 4′ Pelton wheel, under 00′ pressure, through 400′ of 6″ pipe. Twenty men are employed. S. Miller, of Sierra City, superintendent.

*California Gold Production Syndicate's (Ltd.) (St. Charles Hill) Mine* (Drift and Quartz).—It is in T. 20 N., R. 9 E., between Good- ear's Bar on the east and Fiddle Creek on the west, at 2,000′ elevation bove the Yuba River and 4,900′ above sea-level. The property has een developed through an incline shaft, 117′ deep, and a tunnel; the haft will require to be extended 110′ on 60° pitch to reach bedrock. The tunnel, which is 1,000′ long, had reached the rim-rock, but is par- ially caved. The rims are 2,000′ apart on the surface; 700′ of the chan- el passes through the company's ground. A 30 H.P. engine runs the oist and pump; the latter has a 9″ discharge pipe. There are two

quartz claims on the property, designated the *Cleveland* and *Kentuc* which trend N.W.; the Cleveland dips 20°, while the Kentuck di more N.E. There are two ditches taking water out of Fiddle Creel each with a capacity of 200 miner's inches, and about 1¼ miles lon Fourteen men are usually employed, though the property is ten porarily idle.

*Cedar Gold Mine* (Quartz).—See our XIIth Report, p. 263. It is o Kanaka Creek. J. Fessler, of Alleghany, owner.

*Chinese Mine* (Placer).—It is on a bar of the Yuba River, near Cha coal Flat, between Sierra City and Downieville. The pit is 30′ deep and requires the use of a hand derrick and one Chinese pump. Te Chinese are working. A Chinese company, owner.

*Chips Mine* (Quartz).—See our Xth and XIth Reports, pp. 652 an 402. It is 1½ miles E. of Sierra City, at 4,675′ elevation. At presen only prospect work is being done, driving the main drift ahead. Si men are at work. J. Sullivan, of Sierra City, superintendent.

*Cleveland Mine* (Quartz).—See our Xth and XIth Reports pp. 65 and 414. It is 5 miles S.W. of Sierra City, at 4,550′ elevation, an comprises three claims. The main tunnel has been extended to 1,80 long, following the seams of quartz in the slate bedrock, which tren N.W. and swell occasionally to bodies of quartz several feet thick, an carrying in part rich ochery seams. The 12-stamp water-power mil runs during the day only. Eight men are employed. B. Tomola, c Sierra City, manager.

*Clipper Ship Mine* (Drift).—See our XIIth Report, p. 263. It is abou 1½ miles S.E. of St. Louis. D. Conlon, owner.

*Colombo Mine* (Quartz).—See our Xth Report, p. 648. Idle. It is 3 miles S.W. of Sierra City, at 5,150′ elevation. J. A. Roebling Sons, o Trenton, N. J., owners.

*Craycroft Mine* (Hydraulic).—See our XIIth Report, p. 263. It is o Alabama Hill, 8 miles by trail from Downieville, at about 6,000′ eleva tion. During the last two years 500′ of the channel has been worked The present pit is 60′ deep by 150′ wide, all gravel. The tail-flume i 600′ long, and the tailings are restrained by a cribbed dam 200′ wide an 30′ high. The 600 inches of water are supplied (in part) from th Hearst & Haggin ditch, 8 miles long, 2½′ wide on bottom, and 1½′ deep taken from east branch of the Middle Fork of the Yuba River; als from 4 miles of snow-water ditches heading in Rattlesnake Gulch. Th water season is three and a half months. The water is delivered through two lines of 15″ to 11″ pipe, ½ mile long, and under 70′ pressure. Te men are employed. H. Spaulding, J. M. George, and N. Scammon' estate, of Downieville, owners.

*Crown Point Mine* (Drift and Hydraulic).—It is 11 miles E. of Gib sonville, at 5,575′ elevation, and comprises 115 acres. Last year th ground was worked by the hydraulic system, the water being obtaine from Porter's and P. Lawler ravines through a ditch 1 mile long, 6′ o top, 4′ on bottom, with 1½″ grade to the rod, and carrying 1,000 miner' inches, delivered, under 168′ pressure, to a No. 3 giant with 5″ nozzle through 580′ of pipe, reducing from 15″ to 11″. The bank is from 12 to 20′ high, with from 6′ to 7′ of gravel. The tail-flume has 4′ bottoms is rock paved, and set on a 12″ grade to the box. A space 80′x 180′ ha been piped off. The water season lasts four to five months. The dump is through Porter's Ravine to Nelson Creek, where there is a restraining

am (poles and brush) 120′ across and 15′ high; a cribbed dam, ¼ mile elow, for the dead water, is 100′ across and 20′ high, and will be raised ′ higher; the cribbing is filled with stone and brush. In the drifting ortion of the mine a 35′ shaft has been sunk. Six men are employed. innott, Carmichael, et al., of Gibsonville, owners.

*Depot Hill Mine* (Hydraulic).—See our XIIth Report, p. 264. It is miles N. from Camptonville, and comprises 60 acres. Since our last eport the mine has been enjoined; at present a cut is being made to nable the working of the mine with restraining dams. Four men are t work. F. Joubert and partner, of Camptonville, Yuba County, wners.

*Docile Mine* (Quartz).—See our XIIth Report, p. 264. It is on South ork of Kanaka Creek, 3½ miles E. from Alleghany, at 4,050′ elevation. he vein trends along the slate and serpentine contact. An upraise is eing made to connect the tunnels. The mine is pockety, and is being orked by two lessees. F. Smith, of San Francisco, et al., owners.

*Dreadnaught Mine* (Quartz).—See our XIIth Report, p. 264. It is 2 iles N. of Alleghany. Idle. S. S. Crafts & Son, of Alleghany, owners.

*Eclipse Mine* (Quartz).—It is 1 mile S. of Alleghany, at 4,000′ eleva- ion. The vein trends nearly E. and W., dips about 45° N., in the erpentine belt adjoining the slate, and varies from a seam to 6′ in idth, carrying pockets of coarse gold. The ore, carrying arsenical yrites, is worked with a small furnace and a hand-mortar. Three unnels have been run; two from the south are 220′ and 130′ long, and ne from the north is 50′ long. Two men are at work. Appel & Grant, f Alleghany, owners.

*El Dorado Mine* (Quartz).—See Bullion and El Dorado.

*Empire Mine* (Quartz).—See Gold Valley.

*Eureka Mining Co.'s Mine* (Hydraulic).—It is situated 8 miles N. rom Downieville, at 4,800′ elevation, and comprises 20 acres on an ncient channel. The bank is 60′ to 90′ high, 30′ of which is a pipe-clay apping and about 200′ across. The bowlders are blasted. The outlet s through 1,500′ of tunnel into Little Cañon Creek, furnished with a 3′ lume paved with rocks. Two miles below the dump is a restraining am of cribbed logs, 25′ high and 200′ long. An area of 200′x 150′ has een worked during the 3½ to 4 months' water season. Water is obtained artly from snow and partly through the Eureka ditch, which is 5 miles ong and has a capacity of 2,000 miner's inches; it is delivered to two iants, using 4″ and 6″ nozzles, under 70′ pressure, through a double ine of 15″ pipe, 1,000′ long. A clean-up is made once a season. Twelve nen are employed. Spaulding & Mowry Bros., of Downieville, owners.

*Excelsior Mining Co.'s Mine* (Hydraulic).—It is 4 miles N. of Downie- ille, at 4,950′ elevation, and comprises 300 acres on an ancient channel, 300′ across and capped with 25′ of pipe-clay. The bank is 75′ deep in the owest place and carries large bowlders next to the bedrock; the gravel s picking ground, and contains fine gold throughout. The dump is hrough 500′ of a bedrock cut into Eagle Ravine, and from there to Smith's Flat, where there is a brush restraining dam, 25′ high at the ighest part, and 500′ across. The 30″ tail-flume is 600′ long, and rock aved. An area of 300′x 200′ of the channel has been worked. Water s obtained from Wood's Spring, through 2 miles of ditch, with 2′ bot- om, 1½′ deep, and 1″ grade per rod, and is delivered to two giants, using

3" and 4" nozzles, under 170' pressure, through 800' of 11" pipe. Eig men are employed. G. Costar and — Sardine, of Downieville, owne

*Excelsior Mine* (Drift).—See our XIIth Report, p. 265. It is 1½ mil S.E. of St. Louis. Idle. W. N. Bissett, of St. Louis, superintendent.

*Feather Fork* (*Thistle Shaft*) *Gold Gravel Co.'s Mine* (Drift).—See o XIth and XIIth Reports, pp. 330–419 and 265. It is 2 miles S.W. fro Gibsonville, at 5,700' elevation. In October, 1895, the main gangw had been extended 1,500' up the channel and the main breasting w along the east rim, where in places the breasts had been carried 9' hig In running a preliminary gangway down the channel along the ea rim, it appeared that a pay streak follows the east rim past the sha which can be worked by a short drift due east from the shaft. The go found on the east rim is not as coarse in character as that obtained c the west rim, but appears to be more plentiful. The main gangway h been provided with three rails and given sufficient grade to enable th downward, or full, car to bring up the empty one. The company h erected a large new boarding-house, and a covered dump-house of 10,0( to 15,000 tons capacity. The reservoir for washing has 30,000 gallor capacity. Seventy men are employed. W. C. Wingate, of Gibsonvill manager.

*Garibaldi Mine* (Quartz).—It is situated in Gold Valley, at 7,00( approximate elevation. Provided with a 10-stamp mill. Idle.

*Gibsonville Water and Nevada Mining Co.'s Mine* (Hydraulic).—Se our XIIth Report, p. 266. It is ¾ mile N.E. of Gibonsonville, on Slat Creek. Idle. G. W. Cox, of Table Rock, agent.

*Glidden* (*Gold Lake*) *Mine* (Quartz).—See our XIIth Report, p. 26( It is in Gold Valley, 1½ miles N.E. of the Empire Mine. Closed b litigation.

*Gold Bluff Mine* (Quartz).—See our VIIIth and XIIth Reports, pp 579 and 266. It is 2 miles N.E. of Downieville, at 3,200' elevation, an comprises four claims. The main vein, 5' wide, courses N. 20° W., an dips about 55° E.; another, designated "the E. and W. vein," intersect the larger one. The country rock is slate and porphyry. The mine i worked through a cross-cut adit 1,600' long, tapping the vein 700' belov the croppings, and from which a 200' incline has been sunk, showing well-mineralized vein 8' thick. This incline has been connected with th surface by a 540' perpendicular shaft. Two upper tunnels have beer run, cutting two ore-shoots pitching east; considerable stoping has beer done on a shoot 125' long. In the shaft, at the main tunnel level, is ar electric hoist, and pump with 2" discharge pipe. The main tunnel anc stations are supplied with electric lights. The outside plant consists o a 20-stamp water-power mill, with four Johnston concentrators, and al needed machinery for speedy and economical handling of the ores, except a chlorination plant. Four separate water-wheels (Pelton and Dodd) are used. A 124 H.P. dynamo, driven by a 5' Pelton wheel, runs a 3( H.P. motor for hoisting, a 15 H.P. motor for pumping, and a 5 H.P. motor for the blower, besides 60 incandescent lights of 32 candle-power. The water-power is derived from the North Fork of North Yuba River, through 2½ miles of ditch, 2½' wide on bottom, with 1" grade per rod, and carrying 300 miner's inches, delivered under 270' pressure through 600' of 16" pipe. Temporarily idle. G. Costar, of Downieville, owner.

*Gold Valley* (*Empire*) *Mine* (Quartz).—See our XIIth Report, p. 265. It is in Secs. 25 and 26, T. 21 N., R. 11 E., in Gold Valley, 13 miles

.E. of Downieville, at over 7,000′ elevation, and comprises two loca-ons, designated the *Empire* and *Minerva*. The vein courses N. 65° E., nd dips 50° S.E., between walls of igneous rock with good clay gouge. ortions of the vein carry as much as 10% low-grade sulphurets. Since ar last Report the mine has changed ownership, and additions have een made to the plant with reference to the long and severe winters of hat section. A 25-stamp mill, run by electric power, has been placed t the mouth of the main tunnel, and adjoining it, below, a chlorina-on plant of a capacity of 4 tons per day; also an assay and melting epartment. The mill is supplied with seven concentrators—Johnston, rue, and Triumph. The reverberatory furnace has a one-step hearth; is 70′ long, 13′ wide in the clear, and consumes ⅛ cord of wood n 24 hours. There are 4 chlorinating vats of 2½ tons capacity; 2 pre-pitating vats, 1 settler, and several tanks for saving copper; no attempt made to save the silver. The entire works are lighted by electricity, here being 80 incandescent lights of 32 candle-power; a 60 H.P. motor uns the mill and a 60 H.P. motor runs the hoist and compressor. The and compressor drives 1 Rand and 2 Eclipse machine drills. The ynamo is ¾ mile from the works, and is driven by a 4′ Pelton wheel, nder 350′ head, with water diverted through two branches of the Yuba iver. It is said that 25% loss occurs in transmission. Three telephone nes connect the different parts of the works with one another, and also ith Downieville. In the mine, the new company has extended the ncline shaft 200′ below the main tunnel, opened stations on the 100′ nd 200′ levels, and drifted on the sulphuret shoot, stoping from the 00′ level to the main tunnel level. Fifty men are employed. Capt. uckley, of Downieville, manager.

*Golden King Mine* (Quartz).—See our XIth and XIIth Reports, pp. 17 and 266. It is on the South Fork of Kanaka Creek, 3 miles E. from lleghany, at 4,025′ elevation, and consists of the *Gold King*, *Gold Queen*, *Vesuvius*, and *Victor* claims. The *Gold King* and the *Gold Queen* veins ary in width up to 10′, trend N.E. and S.W., and dip 40° to 70° W., between lack slate walls. Where mariposite is found in the vein, it is taken as n indication of good ore. The *Vesuvius* vein trends N.W. and S.E., ips 50° S.W., and varies from a seam to 18″ in width. The *Victor*, on he opposite side of the creek, is undeveloped. The present develop-ents consist of a shaft and two tunnels. No. 2 tunnel extends 596′ on he north side of the creek and 236′ on the south side; this portion is bandoned. The perpendicular shaft intersects No. 2 tunnel and con-nues to No. 3 level, at which point there is a 35′ cross-cut to the vein, hence a drift 374′ N. and 336′ S. No. 4 level is 89′ below No. 3, and, as t would require a very long cross-cut to reach the vein, the portion of he shaft from No. 2 down is being changed to an incline on a uniform lope. The vein in the lower level, as well as in the incline beneath, ooks well. Northeast of the shaft is practically virgin ground, while outhwest of the shaft, in working around a horse on the foot-wall side, n 8′ vein of a good milling grade of ore has been cut. The mine makes bout 240 gals. of water per hour. A pump has replaced the former nethod of bailing. The steam-power used for the 10-stamp mill is to e changed for water, but the machinery of the former will be retained o use in a case of emergency. The water-power is derived from a 5′ Pelton wheel, under 175′ head, from a flume 2,700′ long, diverted by a ock dam across Kanaka Creek below the junction of the South and

Middle forks. Twenty men are employed. W. J. Adams, of Al ghany, manager.

*Golden Star Mine* (Quartz).—It is on the South Fork of the Yu River, 1½ miles E. of Downieville, at 3,525′ elevation, and comprises thi claims. There are two veins; a large one, 6′ to 8′ wide, coursing W. N. and dipping W., and a smaller, blanket ledge, 6″ to 18″ wide, in sla and porphyry, and making into the other. A 150′ tunnel has be started to cut this smaller pocket vein, and is now 70′ long. Two m are at work. C. M. Wilson, of Downieville, manager.

*Hanley & Co.'s Mine* (Drift).—See our XIIth Reports, p. 267. It is French Ravine, 3 miles S.W. from Alleghany, at 4,300′ elevation, a comprises 140 acres. Since our last Report the work has been extend up the channel. Eleven Chinese are at work. Mrs. Hanley & Son, Alleghany, owners.

*Hawkeye and Bell Point Consolidated Gravel Mine* (Drift).—See o XIIth Report, p. 267. It is 5 miles N.E. from Minnesota, at about 5,0 elevation. Twelve men are at work. M. Mehan et al., of Minneso owners.

*Holloway Mine* (Hydraulic).—It is on the east branch of Hopki Creek, 8 miles N.E. from Gibsonville, at about 5,000′ elevation, a comprises 60 acres. The pit bank is 250′ wide and 25′ high, carrying of blue lava gravel next the bedrock; a few feet above it is an 8′ deposit reddish gravel; both are gold-bearing, but of different character. T bank is shaken up with powder drifts, and the bowlders are all blaste the bedrock is a hard, blocky slate. The 40″ tail-flume has 12″ gra to the box; is 120′ long, and dumps into the East Fork of Hopkins Cre where two restraining dams have been built; one a log dam, 133′ lor 8′ high; below, 2,000′, is one of rock, 23′ high and 104′ long. Water diverted from the west branch of East Fork of Hopkins Creek, throu 1¼ miles of ditch of 1,000 inches capacity, during the season of 1 days, and is delivered, under 350′ pressure, through 1,200′ of 15″ to pipe, to a No. 2 giant. Two men are employed. Spencer & Gould, Gibsonville, owners.

*Homestake Mine* (Hydraulic).—It is 10 miles N.E. from Sierra Cit at 6,200′ elevation. The gravel, in the nature of a ravine wash, carri coarse gold, is 10′ deep and is worked 50′ wide, through 150′ of tail-flum 16″ wide, set on an 8″ grade and paved with wooden blocks. The requ site water is obtained from Church Creek, through 2 miles of ditch 100 inches capacity, and is delivered, under 75′ pressure, through 300′ 7″ pipe. The water season lasts 90 days. Four men are employe Atkinson Bros. and C. Wichman, of Sierra City, owners.

*Hughes & Westfall Mine* (Hydraulic).—It is 9 miles N. from Sier City, at 6,650′ elevation, and comprises ten claims along the bed a bars of Howard Creek, including the former *Hayes & Steelman* Mi The gravel is worked with two No. 3 giants in a cut, 150′ wide by 1 deep; in places the gravel is cemented, and one acre was removed du ing the past season. The gold is found on a false or cement bedrock; is coarse and quartzy. Two water-power derricks, with 80′ masts a booms, are worked by a 6′ and a 7′ hurdy wheel, and place the bowlde outside the cut. The gravel is washed through 200′ of 40″ tail-flum set on 5″ and 4½″ grade to the box, paved with blocks; it is dumped in the creek below, where it is restrained by a cribbed log and brush da 33′ high and 200′ long. The water is brought from Howard Cree

rough 150 rods of ditch and 1,600′ of 15″ pipe, delivering 300 miner's ches under 120′ pressure. The water season lasts 100 days. Twenty en are employed. W. Hughes and E. J. Westfall, of Sierra City, wners.

*Jackson's Mine* (Placer).—See our XIIth Report, p. 268. It is on the uth side of the North Yuba River, 9 miles N.W. from Camptonville, 2,450′ elevation. The location comprises one claim on the bank and tailings claim in One Horse Ravine. E. T. Jackson, of Camptonville, vner.

*Kanaka Mine* (Quartz).—See our XIth Report, p. 404. It is midway tween Sierraville and Downieville. Idle. L. Voss, of Downieville, vner.

*Keystone Mine* (Quartz).—See our Xth and XIth Reports, pp. 653 d 403. It is in Sec. 32, T. 20 N., R. 12 E., at 6,100′ elevation. Idle.

*Last Chance Mine* (Hydraulic).—It is 7 miles N. of Sierra City, at 000′ elevation. It is a claim along the bed and bars of Howard Creek. he gravel is 15′ deep and is worked 100′ wide, using 300′ of 30″ tail- ume, set on a 5″ grade and paved with 8″ wooden blocks. A ½ mile tch from Howard Creek delivers 300 miner's inches of water under 00′ pressure, through 500′ of 11″ pipe, to the giant and derrick. The ater season lasts four months. Five men are employed. F. Cadoce al., of Sierra City, owners.

*Lone Star Consolidated Gold Mining Co.'s Mine* (Quartz).—See our IIth and XIIth Reports, pp. 405 and 268. It is 14 miles N.E. of ownieville, at 6,750′ elevation. Idle. J. Weisbein, of Grass Valley, evada County, secretary.

*Lucky Dog Mine* (Drift).—See our XIIth Report, p. 268. It is 1½ iles W. of Forest City. Idle. J. Smith, of Forest City, superintendent.

*Mammoth Springs Mine* (Drift).—See our XIIth Report, p. 268. It is n a branch of Kanaka Creek, at 4,300′ elevation, and comprises 500 acres. ince our last Report the company has started to run for the channel, hich trends N.E. toward the City of Six, and has cleaned out and timbered some of the old works and made an upraise. Five men are mployed. D. Dever, of Forest City, manager.

*Mariposa Mine* (Quartz).—It is 1 mile S. from Alleghany, at 4,000′ levation, and comprises two claims. The 18″ vein trends slightly N. f W., and dips 45° E., between metamorphic slate and serpentine walls. hree tunnels, 430′, 340′, and 295′ long, have been driven. It is 41′ etween No. 1 and No. 2, and 31′ between No. 2 and No. 3, on the dip of he vein; all are connected by winzes and upraises. Two hundred feet n from the mouth of the lower tunnel a 150′ shaft has been sunk and a team hoist placed thereon. The ore has been hand-mortared. Ten nen are employed. H. Appel and — Grant, of Alleghany, owners.

*Minnesota Development Gold and Silver Mining Co.'s (Hope) Mine* Quartz).—It is in Steamboat Ravine, 1½ miles S.E. from Alleghany, at ,325′ elevation, and comprises 4,000′ by 500′. There are several parallel eins trending slightly N. of W. and dipping N., following the intru- ions and depressions of the serpentine which forms the foot-wall. Slate orms the hanging-wall, and, for some of the quartz croppings, both walls. he veins swell and contract, varying from 2′ to 10′ in width, and carry n both sides a gouge, in part of a graphitic clay and with occasional alc slate casings. Mariposite, locally designated "Blue Jay," is also f frequent occurrence. Years ago the southeast end of the claim was

opened by a 200′ cross-cut to the vein, where a 50′ winze was sunk a a drift run on the 3′ to 5′ wide vein, yielding largely. The furth prosecution of the work was hindered by the heavy flow of water; abo 6 miner's inches still flow from the tunnel. The recent developme consist of a 142′ tunnel at the north end of the claim on Steamb Ravine; it forks, one branch following the course of the serpentine fo wall, while the other cross-cuts the general trend of the vein. Crossi the course of the veins above the Hope tunnel is a gravel channel th is being worked by the Snowden or Steamboat Drift Company; it carr a large percentage of auriferous quartz bowlders, with sharp edg The difference in elevation between the old tunnel and the present one about 285′. A mill site below the new tunnel permits of the compa taking water from the McNulty ditch above, under 435′ pressure. Th ditch is 4 miles long, 5′ on top, 2½′ wide on bottom, and takes 600 miner inches of water from Kanaka Creek. Eight men are employed. J. Jones, of Forest City, superintendent.

*Mountaineer Mine* (Quartz).—It is on the Sierra Buttes, 9 miles from Sierra City, at 6,100′ elevation, and comprises six claims, des nated *Lake*, *Mountaineer*, and *Tunnel Ledge No. 2*, with three paral claims. The vein in the Lake is 5′ wide, and trends E. and W. betwe the contact of quartzite and porphyry, while the other two trend N.W and dip 35° to 45° N., in porphyry. The Mountaineer is 8′ wide; t Tunnel No. 2 vein is 6′ to 8′ wide. The developments consist of upper tunnel, 350′ long, cross-cutting to and 200′ beyond the Lake ve An east drift on the Lake vein at this level is 450′ long, and passes 1 through a pay-shoot. On the west end of this vein, 260′ below t upper level, is a tunnel, 1,400′ long, cutting the longest west sho The vein is blind, only exposed through several shallow shafts. tunnel, 422′ long, cuts Tunnel Ledge No. 2, and is being continued cut the Lake vein, which makes considerable water. The 10-stam mill, framed for 20 stamps, is run by water taken from Deer La through 6 miles of ditch, 4′ wide on top and 3′ on bottom, with 2 miner's inches capacity, delivered under 80′ pressure to a 5′ Knig wheel. When required this pressure can be greatly increased. T property includes three sections of timber land, the whole at prese being worked under a bond. Ten men are employed. C. Berger, Sierra City, owner.

*Mount Fillmore Consolidated Mine* (Quartz).—See our XIIth Repo p. 269. It is on the south side of Mount Fillmore, 6 miles from Gibso ville. Assessment work only. C. B. Wright et al., of Gibsonvil owners.

*Mount Moriah* (*Lawler*) *Mine* (Quartz).—See our XIIth Report, 269. It is on Little Wolf Creek, 7 miles N.E. of Minnesota, at 5,0 altitude. Idle. D. R. McIntosh et al., of San Francisco, owners.

*North Fork Co.'s Mine* (Drift).—It is ¼ mile N.W. from Forest Cit at 4,900′ elevation, and comprises 1,200 acres of ground. The prese workings are through a tunnel 1,700′ long, which starts in gravel a reaches bedrock in 1,100′, where swelling is encountered. The "whi quartz channel" to be cut courses W. of N., and has a 2% grade. It tak the continuous work of four men to maintain the grade of the tunnel a relieve the timbers, which are 3′ 8″ caps and 7′ posts, with 11′ sprea The ventilation is through a water-blast. Eleven men are employe J. A. Jones, of Forest City, manager.

*Oxford Mine* (Quartz).—See our XIIth Report, p. 269. It is 1 mile E. of Downieville, at 3,400′ elevation at the mouth of the tunnel. Idle. . Purdy et al., of Downieville, owners.

*Pacific and Alta Mine* (Quartz).—It is 1 mile N. from St. Louis, at 5,000′ levation, and comprises two claims. The vein courses N.E. and dips E.; the country rock is slate; the fissure is 16′ between walls, with 8′ quartz and graphitic gouge on foot-wall. The developments consist an 18′ incline, 4′x 8′ open cut, and an 8′ shaft. The main vein is thrown ′ by a cross-vein, 4′ wide. The quartz is glassy, and carries a few ulphurets; the surface would pay well to hydraulic, thereby uncover- g the outcrop of the vein. Assessment work only. D. Conlan, of St. ouis, owner.

*Phœnix Mine* (Quartz).—See our Xth and XIth Reports, pp. 653 and 02. It is on the south side of the Sierra Buttes, 1 mile N.E. from ierra City, at 4,800′ elevation. Since our last Report the shaft has been nk deeper. Idle. W. Bush, of Downieville, owner.

*Pioneer Mine* (Drift).—See our XIth and XIIth Reports, pp. 412 and 70. It is 1½ miles N. of Port Wine, and comprises 360 acres. The round is supposed to be on the Port Wine channel, which has a N.W. ourse and 4″ grade per rod, and is opened with tunnel and incline. he tunnel is 1,600′ in length, reaching the channel in 1,325′. The ncline is 35′ on a 25° slope. A 12 H.P. gasoline hoist is used. The ravel is mostly quartz, carrying fine gold, and is capped in part with va and pipe-clay; the entire depth is 230′, of which 120′ is gravel. he breasts are carried 3½′ to 4′ high, and 30′ to 35′ wide, timbered with ost and cap. The gravel has to be blasted, a breaster averaging about cu. yds. per shift. The cars contain 19½ cu. ft. A centrifugal ump, run by an 8 H.P. engine, raises 15,000 gals. of water per hour r ten hours. There are 2,200′ of 16″ tail-flume set on a 6″ grade. hirty-five men are employed. J. F. Carter, of San Francisco, owner; . S. Deisen, of Port Wine, manager.

*Plumbago Mine* (Quartz).—See our XIIth Report, p. 270. It is on the innesota side of the ridge, 2½ miles S. of Alleghany, at 4,375′ elevation. ince our last Report, a new 10-stamp mill has been put in running rder, to be driven by a 30 H.P. steam-engine; it is supplied with four Frue anners. The two principal tunnels have been connected by an upraise. wenty men are employed. The mine has recently changed owners.

*Rainbow Mine* (Quartz).—See our XIIth Report, p. 270. It is on anaka Creek, ½ mile S. from Alleghany, at 4,000′ elevation, and com- rises six claims. The main vein courses E. and W., and dips 45° N., etween greenstone and serpentine walls, with a good clay selvage and a artial casing. The vein was first uncovered in the Union Co.'s drift tun- el; later it was tapped in the Hanley tunnel 40′ below, and then 60′ lower n the Groves tunnel, where a station was cut and a 4′x 8′ double-com- artment shaft sunk to 307′ in depth, and provided with a steam hoist. rom this point upward all the stoping was done. The total length of he Groves tunnel is 1,914′. A lower tunnel, started near the creek, xtends with its branches 2,300′, and an upraise from it connects with he upper works 481′ above. No permanent pay-rock has been struck in he lower works. The 10-stamp mill is run by a 5′ Pelton wheel with 300 nches of water from Kanaka Creek, through 3,000′ of 28″x 14″ flume on ″ grade. The mill has not run for several years. Two men are pros- ecting the mine. J. O. Groves, of Alleghany, manager.

*Reece Ravine Diggings* (Placer).—See our XIIth Report, p. 270. It 3 miles S. of Poker Flat, at 5,000′ elevation. Idle. J. R. Alexander, Table Rock, owner.

*Riffle Mine* (Drift).—See our XIIth Report, p. 270. It is in Gra Valley, 2 miles S. of St. Louis. Idle. W. Prosser, of Port Wine, supe intendent.

*Rising Sun Mine* (Quartz).—See our XIth Report, p. 418. It is 1½ mil E. from Alleghany, at 4,430′ elevation. The vein trends N.E. and S.W and dips 70° N.W. It is opened by tunnels, which are connected wire-rope tramway with a 10-stamp mill with two vanners. In Octob 1895, the property was in the Sheriff's hands.

*Rocky Peak Mining Co.'s Mine* (Drift).—See our XIIth Report, p. 27 It is on the Brandy City and Eureka ridge, 4 miles N.E. of Bran City, at 2,015′ elevation. J. Arnott, of Camptonville, superintendent

*Ruby Gravel Mining Co.'s Mine* (Drift).—See our XIth and XII Reports, pp. 406 and 271. The channel is worked out.

*Russell Hill Mine* (Drift).—See our XIIth Report, p. 272. It is Depot Hill, 5 miles N. of Camptonville. W. S. Russell et al., of Cam tonville, owners.

*Sailor Boy Diggings* (Hydraulic).—See our XIIth Report, p. 272. is near Brandy City, at 3,475′ elevation. M. Carter, of Camptonvil lessee.

*Scotia and Alice Consolidated Mine* (Quartz).—See our XIIth Repo p. 272. It is 3 miles S. of Forest City. Idle. W. H. Smith, of Al ghany, owner.

*Sierra Buttes Mine* (Quartz).—See our VIth (Part II), VIIIth, Xt XIth, and XIIth Reports, pp. 56, 573, 643, 402, and 272. It is on t Sierra Buttes Mountain, at Sierra City. The elevation at the croppin is 6,400′, and at the lowest tunnel 4,100′. The property is virtual worked out. A few pillars in the upper works are being robbed. Fifte men are at work. S. Thomas, of Sierra City, superintendent.

*Slate Creek* (*Phil. Doris*) *Mine* (Placer).—It is 6 miles E. from Porte, at 4,000′ elevation, and consists of a tailings claim extending miles long. The tailings were worked with a giant and raised 45′ by hydraulic elevator. Four hundred feet of the channel has been work and 14,000 cu. ft. moved the past season from a pit 90′ wide and deep, in places. The creek has a 2% grade. The gold is coarse and distributed throughout the tailings. The flume for washing is 2′ wi and set on a 3″ grade, and paved with rock. Two hundred inches of wat were obtained from Gibson Creek through 3 miles of 5′x 3′ flume, wi ¼″ grade per rod, delivered under 300′ pressure, through 600′ of 22″ 11″ pipe, to a No. 1 giant with 3″ and 4″ nozzles. The elevator noz is 6″ in diameter. The water season lasts from April to July. Eighte men are employed during the season. W. J. Scrutton, of La Por manager.

*Sierra Gold Co.'s Mine* (Quartz).—It is on the East Fork of Nor Fork of the Yuba River, 2 miles E. of Downieville, at 3,200′ elevation No. 3 tunnel. The property comprises seven claims on the *Ackley* *High Commissioner* vein; two on the *Crouse* vein; and seven on t *Mexican*. These parallel veins have a N.W. course, with a distance 400′ between the Ackley and Crouse; thence 1,000′ to the Hillside, a 200′ thence to the French, vein. There are three working tunnels, 5 160′, 440′ long, and a 15′ shaft, below the lowest one on the Ackley vei

hich is 20′ wide on an average. The difference between the highest outop and the lowest tunnel on the Ackley is 100′. The lowest tunnel on e Ackley is being pushed ahead to cut the vein. On the Crouse vein, ′ to 14′ wide, are four tunnels, 100′, 100′, 165′, 365′ long. These ores rry about 5% of arsenical pyrites, which appear frequently quite masve. A water-right of 3,000 miner's inches is held by the company, and to be diverted from East Fork of the North Fork of the Yuba and livered through 500′ of flume, under a head of 40′, at the company's fill site. Four men are employed. C. Purdy, of Downieville, manager.

*Slug Cañon Tunnel Co.'s* (*Van Clieff*) *Mine* (Quartz).—It is in Slug añon, 1½ miles S. from Downieville, at 3,500′ elevation. Two veins, 0′ apart, course N. and S. and dip E. The larger one is 8′ and the naller one 20″, between slate walls. A cross-cut tunnel near the eek is 400′ long and will have to be extended 300′ to cut the veins. he previous workings were all much higher up on the mountain side. even men are at work. I. Copeland, of No. 530 California Street, San rancisco, manager.

*Snowdon* (*Steamboat*) *Mine* (Drift).—It is near the head of Steamboat avine, 2 miles S.E. from Alleghany, at 4,450′ elevation, and comprises 20 acres along the Minnesota Ridge channel. This channel has a N. nd S. course and is lava-capped. There is on the claim an old tunnel 500′ long, but only used at present for a distance of 900′, where short upises of 4′ to 5′ reach the rim gravel; the center of the channel is about 00′ yet ahead. The tunnel has 3′ caps and 5′ posts, with 6′ spread. he bedrock is serpentine and slate. A 100′ air-shaft ventilates the unnel. The breasts are 2½′ wide in gravel and 1½′ in bedrock, and are 0′ wide, timbered with post and cap; no gravel is being extracted. Wash-water is obtained from springs and carried to three small reservoirs y 900′ of ditch, permitting ten minutes washing with 3″ nozzle under 0′ pressure, through 150′ of 6″ pipe. There are 160′ of 12″ tail-flumes aved with Hungarian and rock riffles. The gold is mostly rough. Six en are at work. L. Evans et al., of Alleghany, owners.

*South Fork Co.'s Mine* (Drift).—See our XIIth Report, p. 272. It is mile S.W. from Forest City, at 4,900′ elevation, and comprises 400 eres. The channel passes under the ridge dividing Forest City from lleghany. A former company, in driving the tunnel for this purpose, ot off the course and missed the channel; the present company utilized he front portion of the tunnel, which passes directly under and across he Live Yankee channel, and then took their bearings and grade for a oint beyond, where the channel had been established in former days hrough an incline shaft. The channel is known as the Bald Mountain ava channel, although it is a white quartz channel. The tunnel is eing driven ahead at the rate of 8′ per day in slate bedrock, which if ontinued will reach the tunnel about May 1, 1896. The channel is 0′ wide, and there are about 4,000′ of the channel on the company's round. Where the Bald Mountain Extension Co. crossed this channel n driving their main tunnel they accounted for $200,000 taken out. he lowest average was $2 50 per car. Seven men are employed at resent. J. O. Jones, of Forest City, manager.

*Sunset Mine* (Drift).—See our XIIth Report, p. 273. It is about ¼ ile below Goodyear's Bar. Idle. J. R. Williams et al., of Goodyear's ar, owners.

*Taber Gold Mine* (Drift).—See our XIIth Report, p. 273. It is ¼ m S. of Gibsonville. Idle. H. Taber, of Gibsonville, owner.

*Thistle Shaft.*—See Feather Fork Gold Gravel Co.

*Tippecanoe Mine* (Hydraulic).—It is 5 miles E. of Camptonville, 4,200′ elevation. The bank has 25′ of gravel, capped with pipe-cl The water is diverted from Oregon Creek, through 6 miles of ditch wi ½″ grade per rod and a capacity of 500 inches, and is delivered und 70′ pressure to a No. 3 giant using a 3″ nozzle, through 300′ of 16″ pi The restraining dam is built of rock and brush, 21′ high, 55′ long on t and 20′ thick at the base. Five men are employed. G. Perrant, Tippecanoe, owner.

*Tough and Hardy Mine* (Placer).—See our XIIth Report, p. 273. is 1½ miles E. of Camptonville. Idle. W. B. Meek et al., of Camptc ville, owners.

*True Fissure Mine* (Quartz).—See our XIth and XIIth Reports, p 405 and 274. It is 15 miles E. of Downieville, at 7,400′ approxima elevation, and comprises six claims. Since our last Report furth developments have been made, chiefly in driving the main tun ahead. Five men are employed. G. Reynolds and — Bishop, of S Francisco, owners.

*Union Consolidated* (*Happy Hollow*) *Mine* (Drift).—See our XII Report, p. 274. It is 5 miles N.E. from La Porte. Temporarily id G. W. Miller, of Port Wine, superintendent.

*Watts Mine* (Drift).—See our XIIth Report, p. 274. It is betwe the North Yuba River and Big Humbug Creek, 9 miles N.E. of Cam tonville. J. Watts, of Camptonville, owner.

*Wide Awake Mine* (Drift).—See our XIIth Report, p. 274. It is Alabama Hill, 7 miles N.W. from Downieville, at 5,645′ elevatic Since our last Report they are prospecting for back part of chann Water is diverted from Little North Fork of the Yuba, through 8-mile ditch, 3′ wide, 2′ deep, and of 800 miner's inches capaci Water season lasts three months. Eight men are at work. J. Bran of Downieville, manager.

*William Tell Mine* (Quartz).—See our Xth and XIIth Reports, p 653 and 275. Idle. Caspar Joos et al., of Sierra City, owners.

*Young America Mine* (Drift).—See our XIIth Report, p. 275. It at Forest City. Idle. B. F. Dickinson et al., owners.

*Young America Mine* (Quartz).—See our Xth and XIIth Repor pp. 643 and 275. The tailings from the mill of this property we saved, and are said to aggregate 150,000 tons. They and the mine we recently sold and a cyanide plant of 100 tons daily capacity erecte which commenced operations in September, 1896. S. M. Green et a of Milwaukee, Wis., owners; Oscar Cecil, of Sierra City, superintende

## MILLS IN SIERRA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Bonanza | | 40 | 850 | 70–80 | | | | | | |
| Butcher Ranch | | 12 | 750 | | | | | | | |
| Buttes Saddle | Water | 10 | 750 | 13 | | | | | | |
| Chips | Water | 10 | 750 | | | | | | | |
| Cleveland | Water | 12 | 850 | 26 | | | | | | |
| El Dorado and Bullion | Water | 10 | 750 | 14 | 2 | Johnston | | | | |
| Gold Bluff | Water | 20 | 900 | 40 | 4 | Johnston | | | | |
| Golden King* | Steam | 10 | 850 | 24 | 4 | Triumph | | | | |
| Gold Valley | Elect. | 25 | 850 | 50 | 7 | | 1 | 4 tons. | | |
| Mountaineer | Water | 10 | 850 | 30 | | | | | | |
| Phœnix | | 10 | | | | | | | | |
| Plumbago | Steam | 10 | 850 | 25 | 4 | Frue | | | | |
| Rainbow | Water | 10 | 850 | | 4 | Frue | | | | |
| Rising Sun | | 10 | 850 | | | | | | | |
| William Tell | | 3 | | | | | | | | |
| Young America | | 40 | | | | | | | | |

*Power to be changed to water.

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SIERRA COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Bull of the Woods | Steam | 1 | Huntington | 4′ | | | | | | | |

## Siskiyou County.

*Abers Mine* (Drift).—It is on Slide Creek, 5½ miles S.W. of Callaha at 4,820′ elevation. It is worked by drifting the creek bank. Thom Abers, of Callahan, owner.

*Ahlgren Mine* (Hydraulic).—See our XIIth Report, p. 276. It li on Salmon River, 5 miles below Sawyer's Bar, at 2,240′ elevation. Tl bank is 80′ high, with 20′ of gravel near the soft, decomposing syeni bedrock. The sluices are 20″x 24″ and 1,500′ long. Water is tak from Little North Fork through 4 miles of 2½′x 2′ ditch and flum with a 12′ grade per mile. There are 800′ of 12″ and 8″ pipe, and a N 1 giant working under 150′ pressure. Bowlders are removed by a lar derrick, driven by a hurdy wheel. A sawmill, with 56″ saw, belongs the mine. About 1 acre of ground was piped off during 1895. Ahlgren, of Sawyer's Bar, owner.

*Albers Mine* (Hydraulic).—It is on Klamath River, 14 miles belo Cottage Grove, at 940′ elevation. Water is furnished by a ditch 1 mi long; 100′ of 7″ hose and a 2″ nozzle are used. The 2′ sluices are set o an 8″ grade. Henry Albers, of Cottage Grove, owner.

*Allen Mine.*—See Green Mountain.

*Altoona Mining Ditch.*—See Campbell Mine.

*Amazon Mine* (Quartz).—It is 2 miles S. from Henley, in Cottonwoo District, at 2,325′ elevation. There are several veins; the principal on 4′ wide, trends E. and W., and dips 45° N., in a greenstone formation i close proximity to sandstone. The quartz carries about 1% of iron an copper sulphurets. The developments consist of a 15′ incline and se eral open cuts, about 30′ long, along the croppings. The ore is reduce in a 10-stamp mill on the adjoining property. Two men are at worl C. B. & J. O. Jillson, of Henley, owners.

*American Bar Mine* (River).—It is on the Klamath River, 9 mil W. from Hornbrook, at 2,035′ elevation. It consists of 20 acres on bar, and a quartz location, 3,000′ by 600′, on a 4′ vein, trending N.W. an dipping S.W., between slate and diabase walls. The quartz carries large percentage of sulphurets, but is not being worked. On the ba there are two water-wheels; one, 15′x 18″, for hoisting, and one, 16′x 22′ to run a gravel elevator and Chinese pump. A 4-ton derrick, with a 7 boom, is also in use. The gravel is 35′ to the bedrock, carrying gol throughout, part of which is quartz gold. Six hundred cubic yards c gravel are moved in twenty-four hours, averaging 75 cents per yar Three hundred feet of sluices, set on an 8″ grade and furnished wit Hungarian riffles, are required for washing; these are cleaned every day Twenty men are employed, day and night. An incorporated company owner; James Main, of No. 265 Second Street, Portland, Or., secretary J. C. Bayer, of Hornbrook, superintendent.

*Ampback (Fagundez) Mine* (Quartz).—See our XIth and XIIt Reports, pp. 432 and 276. It lies in Eddy Gulch, 3 miles S. of Sawyer' Bar, at 3,060′ elevation. Worked through four tunnels, 200′ to 500 long, on the vein. The ledge is 3″ to 12″ thick, and dips 20° to 75° E During 1895, 350 tons of ore were extracted and milled in the 5-stam mill, with 750-lb. stamps, driven by a Pelton wheel. Idle. R. L Fagundez, of Etna, owner.

*Anderson Mine* (Placer).—It is on Eddy Gulch, 2½ miles S. of Sawyer's Bar, at 2,870′ elevation. The claim contains 10 acres, and is worked by ground-sluicing and drifting. John Anderson, of Sawyer's Bar, owner.

*Andrews Mine* (River).—See our XIIth Report, p. 276. It lies on Klamath River, 1 mile above Hamburg Bar, at 1,780′ elevation. Coffer-dams are being built in the Klamath River to inclose about ½ acre, at a place where the water is from 6′ to 10′ deep. The coffer-dams are made of log cribs pinned together with oak saplings and lined with 1″ boards; they are filled with rock and earth. It is supposed that bedrock lies 15′ to 20′ below water-level. There are three large current-wheels, resting partly on the coffer-dam and partly on a pier. One is 20′ in diameter and 16′ wide, with buckets on the rim to dip water; and the other two, 20′ in diameter and 7′ wide, will drive large Chinese pumps and furnish power for the derrick. Martin Andrews et al., of Scott Bar, owners.

*Andrews Mine* (Hydraulic).—It is 1½ miles N. of Scott Bar, on the second bench, at 2,140′ elevation. Water is taken from Muck-a-Muck Gulch, through a ditch 1½ miles long. There are on the claim 2,000′ of 12″ to 14″ pipe and a No. 2 giant, working under 300′ pressure. Idle. William Kittlewood, of Hamburg, owner.

*Auberry Mine* (Hydraulic).—See our XIIth Report, p. 277. It lies on Klamath River, 1 mile below Cottage Grove, at 1,075′ elevation. The bank is 40′ high, with 15′ of gravel. The 22″ wide sluices are set on an 8″ grade. A ditch 1 mile long, conveys water from Auberry Creek and delivers it, through 450′ of 10″ pipe, to a No. 2 giant under 150′ pressure. Roland R. Auberry, of Cottage Grove, owner.

*Ayles & Dunn Mine.*—See Indian Bar.

*Bailey Mine* (Drift).—See our XIIth Report, p. 277. It lies on Klamath River, 6½ miles below Seiad, at 1,550′ elevation. Worked by drifting in the bank of the river. C. M. Bailey, of Seiad, owner.

*Baker Mine* (Hydraulic).—See our XIIth Report, p. 277. This claim lies on Indian Creek, 6 miles N. of Fort Jones, at 3,150′ elevation. It contains 20 acres of gravel, 30′ to 35′ deep. About 600 inches of water are taken from Indian Creek through a mile of ditch and 800′ of 6″ pipe, producing a pressure of 85′ in a No. 1 giant. George Baker & Sons, of Fort Jones, owners.

*Baker and Coyote Mine* (Hydraulic).—It lies on Indian Creek, 6 miles N. of Fort Jones, and is nearly worked out. Abandoned.

*Banner Mine* (Quartz).—See our XIIth Report, p. 277. It is in Quartz Valley, near Evans' Gulch. The vein is 5′ wide and dips 45° E. Developed by a cross-cut tunnel 300′ long, and two drifts on the vein, 300′ and 600′ long. The ore is worked in an arrastra. Henry J. Diggles, of 57 Crocker Building, San Francisco, owner.

*Barry & Co.'s Mine.*—See Whistlehear.

*Barton Mine* (Drift).—It is situated on Klamath River, ½ mile below Oak Bar, at 1,900′ elevation. Worked by drifting in the bank of the river, 15′ above water-level. H. J. Barton, of Oak Bar, owner.

*Barton & Lichen Mine* (River).—It lies on Klamath River, 5 miles below Oak Bar, at 1,850′ elevation. They are working a bar in Klamath River, 10′ below water-level. A Chinese pump and the derrick are driven by an overshot wheel. Water for power is taken from Horse Creek by a ditch 2 miles long. Sing Co., of Oak Bar, owner.

*Beamer Mine* (Placer).—It is on Russian Creek, 10 miles N.E. f Sawyer's Bar. Worked by ground-sluicing. Idle. James Carr's hei owners.

*Bear Bar Mine* (Drift and Placer).—See Lee Han.

*Beard Bros.' Mine* (Drift).—It lies on the Salmon River, 9 mi below Cecilville, at 1,850′ elevation. Worked by drifting in the ba of the river. Beard Bros., of Black Bear, owners.

*Beebee Bar Mine* (Hydraulic).—See our XIIth Report, p. 277. It on Scott River, 1½ miles below Scott Bar, at 1,660′ elevation. Water taken from the San José Co.'s ditch, through 1,000′ of 8″ pipe, a delivered to the No. 1 giant under 300′ pressure. During the dry seas mining is done in the river-bed, 10′ below water-level. A brush wir dam in the river and a 3′ ditch, ¾ mile long, furnish water for t sluices. Two current-wheels drive a Chinese pump and derrick. Quo Hong Co., of Oak Bar, owner.

*Bee Lee Mine* (Drift).—See Black Lead.

*Bender Mine* (Quartz).—See our XIIth Report, p. 277. This is Miner's Creek, 7 miles S.E. of Etna. There are two tunnels, 70′ a 100′ long, and an incline 75′ deep. The vein is about 4′ thick and di 50° N.W. A Huntington mill, driven by a water-wheel, is on t premises. Idle. W. Chambers et al., of Etna, owners.

*Bennett Mine* (River).—See our XIIth Report, p. 277. It is in t bed of Scott River at Scott Bar, at 1,900′ elevation. The wing-da incloses about ¼ of an acre; three current-wheels furnish power for pump, a hoist, and raise water for the sluices. The bedrock lies 2 below water-level. William T. Bennett, of Oak Bar, owner.

*Bennett Mine* (Hydraulic).—See Horn.

*Berry Mine* (Drift).—It is on Klamath River, 5½ miles above Hap Camp, at 1,450′ elevation. Worked by drifting in the bank of the rive John Berry, of Happy Camp, owner.

*Better Yet Mine* (Quartz).—This new location lies on the head Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,010′ elevation. A 1 open cut exposes a 4′ vein of quartz, which dips nearly vertically ar courses N. and S. C. C. Humphrey, of Scott Bar, owner.

*Big Ben Mine* (Placer).—See our XIIth Report, p. 277. It lies Shackleford Creek, in Quartz Valley. Water for sluicing is taken fro the creek. Many large bowlders are found on the bedrock, and mal mining expensive. S. E. Adams, of Fort Jones, superintendent.

*Big Ledge Mine* (Quartz).—See our XIIth Report, p. 277. It lies of Mugsville, in Quartz Valley. Idle. H. J. Diggles, of Fort Jone owner.

*Bigelow Mine* (River).—This is on the North Fork of Salmon Rive 4½ miles below Sawyer's Bar, at 2,120′ elevation. The claim lies in th river, and embraces 6 acres; the bedrock is 18′ below water-level. A da in the river 9′ high, built of logs, raises the water to a 4′x1½′ flume, mile long, and with a 9′ grade. The overshot water-wheel drives tw Chinese pumps and furnishes power for a large derrick. The sluices a 18″x14″, and set on a 6″ grade. G. F. Bigelow, of Sawyer's Bar, owne

*Billups* (*Cleland, Brown & Billups*) *Mine* (Quartz).—See our XIIt Report, pp. 279 and 280. This lies at the head of McKinney Creek, 1 miles N.E. of Scott Bar, at 4,320′ elevation. A tunnel 50′ long expos a 4′ vein of quartz. Assessment work only is done. Robert Billups, Oak Bar, owner.

Current Wheels, Bennet River Mine.

Current Wheels, Brady Mine, Scott River.

*Black Bear Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 320 and 656. It is on Black Bear Creek, 8 miles S. from Sawyer's Bar, at 3,680′ elevation. In the *Yellow Jacket*, which lies north of the *Black Bear*, two veins were worked near the surface through short tunnels. Later the adit of the Black Bear was extended north, and the veins, which had come together, were cut at a depth of 800′ below the surface. Considerable good ore was stoped from above this level and work is now being prosecuted—tunnels having been driven on the vein 300′ higher to give air and to facilitate the handling of timbers and disposing of waste. In March, 1895, a vein, 4′ to 8′ thick, being the southern extension of the Black Bear vein, was discovered beyond the dike, and a large force of men were taking out the surface ore in August, 1895. The foot-wall is porphyry, and the hanging-wall a soft black slate. The ground is very heavy, owing to the disintegration of the slate. The ore is a crumbly mass of crushed quartz and clay, stained red by iron. The black slate of the hanging-wall is more than 1,000′ thick, and can be traced nearly to the South Fork of Salmon River. Below the croppings, banded quartzites of great thickness are exposed, and beyond them a wide belt of serpentine crops out. The ore is handled several times by tramways, gravitation inclines, and self-delivering chutes before it reaches the mill, 2 miles below the mine. The 16-stamp mill has lately been reconstructed, and self-feeders and four Frue concentrators added. The ore contains about 2% of rich sulphurets, and 500 tons were crushed per month during 1895. Hon. John Daggett, of San Francisco, owner; Ben Daggett, of Black Bear, superintendent.

*Blackburn Mine* (Hydraulic).—This lies on Salmon River, 6 miles above Summersville. It is a recent location, and a ditch is being dug. Blackburn Bros., of Cecilville, owners.

*Blackhawk Mine* (Quartz).—See Claughry.

*Black Jack Mine* (Drift).—See our XIIth Report, pp. 278 and 469. It is situated in Cottonwood Mining District, 1½ miles W. from Hornbrook, at 2,625′ elevation, and carries a large body of auriferous conglomerate, which is crushed in a stamp mill. The mine was worked under bond until the small prospecting mill was destroyed by fire, when the property was closed. Considerable tunneling has been done on both sides of Rancheria Creek; the main tunnel has been driven 300′, a little W. of N. The company obtains 100 inches of water from Rancheria Creek, through 1½ miles of ditch, under 110′ head. W. H. Ritchie, of Henley, superintendent.

*Black Lead* (*Bee Lee*) *Mine* (Drift).—This is situated near Greenhorn Gulch, 2 miles S.W. from Yreka, at 2,640′ elevation. The gravel channel is opened through a 4′x 6′ vertical shaft, 60′ deep, and furnished with a 6″ jackhead pump, with 3′ stroke, and a hoisting drum operated by an 8 H.P. engine. The gravel has been breasted W. and S. from the shaft, and carries a large percentage of bowlders, the breasts being carried 4½′ to 5′ high and 24′ wide. Both square-set and post and cap timbering are used. The gravel is washed through six boxes, set on an 8″ grade, with water pumped from the mine, no quicksilver being used. The gold is coated black. At present the mine is being worked by 10 men, under a five years' lease to J. W. Scheld. Mrs. Bee Lee, of Yreka, owner.

*Blake's Mine* (Drift).—It lies at Sawyer's Bar, at 2,380′ elevation, and is worked by drifting in an old channel back of town. Peter Blake, of Sawyer's Bar, owner.

*Blind Lode Mine* (Quartz).—See our XIIth Report, p. 278. It lie mile W. of Oro Fino, at 3,420′ elevation. There are three tunnels on t 12″ vein, 300′ to 400′ long. H. J. Diggles, of Fort Jones, owner.

*Bloomer Mine* (Hydraulic).—See our XIIth Report, p. 278. It is Salmon River, 6 miles below Forks of Salmon, at 975′ elevation, a contains 60 acres. Water is taken from Nordheimer Creek, through 4′ ditch 3 miles long with a 19′ grade; 1,200′ of 11″ pipe and a No giant, under 200′ pressure, are used. The sluices are 24″ wide and ha an 8″ grade. W. P. Bennett, of Forks of Salmon, owner.

*Blue Mine* (Quartz).—See Schroeder.

*Blue Gravel Mine* (Drift).—It is 1½ miles S. from Yreka, at 2,640′ e vation. During the past year a 100′ shaft has been sunk to bedrock, a a derrick, run by a 7 H.P. engine, is used for hoisting. The gravel min is about 4′ high. Water is obtained from Greenhorn Gulch and a from the Yreka ditch. Six men are employed in the mine and 4 the surface. A. Lee, of Yreka, owner; Austin & Raines, operators.

*Boles Claim* (Placer).—See our XIIth Report, p. 278. This is Horse Creek, 15 miles N.W. of Oak Bar, at 2,260′ elevation. Water sluicing is taken from Horse Creek; the ditch is 1,200′ long and 3′ wi Hungarian riffles are used in the sluices. W. Robertson, of Scott Riv owner.

*Bonanza Mine* (Quartz).—See our XIIth Report, p. 278. It lies Grizzly Creek, a tributary of Indian Creek, 2½ miles N. of Hoopervil at an altitude of 3,860′. Idle. H. J. Diggles, of Fort Jones, owner.

*Bostetter Mine* (Drift).—This lies in North Fork Cañon, 2 miles S. Sawyer's Bar, at 2,740′ elevation. It is worked by drifting in a seco bench. Charles Bostetter et al., of Sawyer's Bar, owners.

*Bowersox Mine* (Hydraulic).—See our XIIth Report, p. 278. It l ¼ mile above Somes Bar, on Salmon River. Idle. W. H. Bowersox, Somes Bar, owner.

*Boye Mine.*—See Scott River Mining Co.

*Boyle Mine* (Quartz).—See our XIIth Report, p. 278. It is in t Humbug District, N.W. of Yreka, at 4,700′ elevation, and includes eig claims. The vein, from a few inches to 3′ in width, courses N.E., a dips about 45° S.E., in a serpentine country rock; the main cross-c tunnel is 900′ long; it is ventilated by a small Root blower and wood air boxes. A second tunnel, 150′ above, cross-cuts 200′ to the ve The steam-power mill contains four 750-lb. stamps, discharging the pu to a 3′ Huntington mill, through a No. 4 screen. Timber is abunda though little is required in the mine. The property is in litigation, a idle. Osborne & Gonzales, of San Francisco, owners.

*Brady Mine* (River).—It is in the river-bed at Scott Bar. Bedro lies 16′ below water-level. A wing-dam made of brush and ea incloses the mine. The gravel is handled by wheelbarrow. A d wheel and a pump-wheel are driven by the current. A. Brady, of Sc Bar, owner.

*Brass Wire Mine* (Placer).—It is about ½ mile S.E. from Henley, 2,350′ elevation, and contains 80 acres. The gravel carries fine g throughout, lies on sandstone bedrock, and is 6′ to 20′ thick. It washed with 540 inches of water through a No. 8 giant using 2″, and 4″ nozzles, under 80′ pressure, derived from Cottonwood Cre through 6 miles of ditch. Bedrock flume is cleaned up once a mon

our men are employed. W. H. Smith and — Harvey, of Henley, vners.

*Brazil Co.'s Mine* (Placer).—It is 1 mile N. of Hawkinsville, and ntains 40 acres of ground; a half interest in the lower Greenhorn itch, which is nearly 10 miles long and takes its water from Greenhorn reek, also belongs to the claim; this yields from 150 to 200 inches of water uring four months. The gravel bank, 14′ in height, carrying few owlders, is worked by ground-sluicing, with a little drifting during ie summer months. The boxes are 2′ wide and 16″ high, with slat ffles. The gold is coarse next the bedrock. Eight men are employed uring the season. Manuel A. Brazil et al., of Hawkinsville, owners.

*Bret, Lacy & Barton Mine.*—See Horse Creek Mining Co.

*Brown Mine* (Hydraulic).—It lies 6 miles E. of Cecilville, on the East ork of Salmon River. Water is taken out of East Fork by a 3′ ditch, miles long; 700′ of 10″ pipe and a No. 1 giant, under 120′ pressure, re used. Thomas George, of Cecilville, owner.

*Brown & Billups Mine.*—See Billups.

*Brown Bear Mine.*—See Golden & Eveleth.

*Brunt Mine* (Drift).—See our XIIth Report, p. 279. It lies ½ mile . of Scott Bar, at 1,840′ elevation. Worked by drifting in the bank of cott River. John Brunt, of Scott Bar, owner.

*Buckeye Bar Mine* (River).—See our XIIth Report, p. 279. It lies n Klamath River, 3 miles above Oak Bar, at 1,985′ elevation. About n acre of gravel is inclosed by coffer-dams in the river. Bedrock lies 0′ below water-level; 3 large current-wheels furnish power for a derrick, Chinese pump, and to dip water for the sluices. Fifteen Chinese are t work. Lem Co., of Oak Bar, owner.

*Buckhorn* (*U. S.*) *Mine* (Placer and Drift).—See Kellner, Doescher & Iahr.

*Bunker Hill Mine* (Hydraulic).—See our XIIth Report, p. 279. It s on Klamath River, 15 miles below Happy Camp, and contains 160 cres, at 1,260′ elevation. Water is taken from Independence Creek, hrough a 3′x 2′ ditch 4 miles long, with an 8′ grade. There are 2,000′ f 11″ pipe, and two No. 2 giants under 100′ to 400′ pressure. The ank is 150′ high, with 50′ of gravel. George Temple, of Happy Camp, wner.

*Burk Mine* (Drift).—This is on Klamath River, 1 mile below Oak ar, at 1,895′ altitude. Worked by drifting in the bank of the river. Villiam Burk, of Oak Bar, owner.

*Burns Mine* (Hydraulic).—See our XIIth Report, p. 279. It is in ddy Gulch, 2 miles S. of Sawyer's Bar, at 2,800′ elevation. There are 00′ of 7″ pipe, and a No. 1 giant working under 100′ pressure. A ditch mile long conveys water from Eddy Gulch. The 18″x 20″ sluices are t on an 8″ grade. William Burns, of Sawyer's Bar, owner.

*Butza Mine* (Hydraulic).—It lies on the Klamath River, 10½ miles elow Happy Camp, at 1,540′ elevation. A ditch 1½ miles long conveys ater from a small creek to the claim. There are 350′ of 9″ pipe and a o. 1 giant. The bank is 20′ high and all gravel. The claim lies on he second bench, and contains 20 acres. Jean Butza, of Happy Camp, wner.

*California* (*Oregon*) *Bar Mine* (Drift).—It is on the Klamath River, ½ miles W. from Hornbrook, at 2,075′ elevation. A 35′ shaft to bed- ock is used for hoisting and pumping. The gravel is free and breasted

6′ high, timbered with post and cap; the gold is coarse, and near bedrock. A 20′ river-wheel furnishes power for pumping and hoisti Six men are at work, Ellis Price & Co., of Hornbrook, owners.

*Campbell Mine* (Hydraulic and Drift).—See our XIIth Report, p. 2 This is on Sucker Flat, in Quartz Valley, and comprises 1,500 ac lying at 3,200′ elevation. About 8,000 inches of water are used. pipe is 11″ to 22″ in diameter, and two No. 3 giants are used under 150 210′ pressure. The bank is 20′ to 45′ high, with about 12′ gravel. sluices are 4′ wide and are set on a 3″ grade. During 1894, about acres of bedrock were cleaned up, and in 1895, 2½ acres. No drift has been done since 1892. The company owns three ditches. *Altoona ditch* takes water from Kidder Creek, is 14 miles long, 5′ w and 2½′ deep, and is built on a 13′ grade. *The Shackleford ditch* ta water from Shackleford Creek; it is 12 miles long, 6′ wide, 3′ deep, a has a 7′ grade. *The China ditch* takes water from Mill Creek, is 5 m long, 4′ wide, 3′ deep, and has a 7′ grade. The R. H. Campbell G Mining Co., owner; Charles Roberts, of Etna, superintendent.

*Campbell & Austin Mine* (Placer).—See Quinn & McConnell.

*Cannon Mine* (Quartz).—See our XIIth Report, p. 279. This is the South Fork of Salmon River, 6½ miles above Forks of Salmon. Th is a tunnel 100′ long on the claim. The vein is about 6″ wide, a stands nearly vertically. Joseph Cannon, of Black Bear, owner.

*Cariboo Mine* (Quartz and Placer).—It is on the South Fork of Saln River, on the flank of Cariboo Mountain, 23 miles W. of Trinity Cen at 5,150′ elevation, and comprises three full claims parallel to each oth The center claim is on an auriferous porphyritic dike, 100′ wide, wh veins on the other two claims course E. and W.; the upper one is wide, between slate and porphyry, and nearly vertical; the lower on 5′ wide, between walls of porphyry. A 250′ tunnel has been run on dike; an 80′ one on the upper claim; a 200′ one on the west end; an 128′ one on the east end of the lower claim, where there is also a shaft. The surface along the outcrops yields well for piping. Five m are at work. G. & J. Abrams, of Abrams, Trinity County, owners.

*Carl & Shaw Mine* (Quartz).—See our XIIth Report, p. 279. It in White's Gulch, 5 miles S.E. of Sawyer's Bar. It is an extensio the Smith & Merriman claim. Idle. Carl, Shaw, et al., of Sawy Bar, owners.

*Carter Mine* (Hydraulic).—It is on the Klamath River, 6 miles be Cottage Grove, at 1,020′ elevation. Water is taken from several sm creeks and collected in a reservoir. The bank is 50′ high and shows of gravel. There are 500′ of 11″ pipe and a No. 2 giant, under pressure, on the claim. Norman Carter, of Cottage Grove, owner.

*Carter Mine* (Drift).—This is 6 miles S.W. of Callahan, at 5,5 elevation. It is worked by drifting in the bank of Slide Creek. Jos Carter, of Callahan, owner.

*Cartwright & Phillips* (*Mountain Belle*) *Mine* (Quartz).—See our X Report, p. 445. It is on the North Folk of Humbug Creek, 16 m N.E. of Yreka, at 3,500′ elevation, and comprises 3,000′ by 600′. vein averages 2′ in width, trends N.E., and dips 45° S. Since our Report, a block of ground 80′ long by 200′ deep has been stoped; a tunnel cross-cuts the vein 80′ below, from which 150′ of drifts on the v have been run, preparing 275′ for stoping. Four men are at wo Cartwright & Phillips, of Humbug Creek, owners.

*Casey Mine* (Hydraulic).—It lies at the Forks of Eddy Gulch, 2½ les S. of Sawyer's Bar, at 2,930′ elevation. There are 430′ of 6″ pipe, d a No. 1 giant working under 160′ pressure. The bank is 25′ high d all gravel, and the derrick is run by an overshot water-wheel. ater is taken out of West Fork by a ditch ¼ mile long. Smith & milton, of Sawyer's Bar, owners.

*Cash Mine* (Hydraulic).—This is on the South Fork of Salmon River, miles above Forks of Salmon, at 1,870′ elevation. Water is taken m the Red Hill ditch, through 500′ of 14″ pipe, and delivered to a . 2 giant under 90′ pressure. Parker & Sons, of Etna, owners.

*C. B. & Q. Mine* (Quartz).—It lies ½ mile S. of Oro Fino and S. of e Pitz Mine. The developments consist of two tunnels, 30′ and 40′ g, respectively; the vein carries 7″ of quartz. Idle. David Ray et , of Oro Fino, owners.

*Centennial Mine* (Placer).—See our XIIth Report, p. 279. It is at ttville, at 1,950′ elevation, and comprises 11 acres. The gravel is m 40′ to 50′ thick. Idle. N. G. Gott et al., of Gottville, owners.

*Challenge Mine* (Quartz).—It is between the Forks of Deadwood eek, 2 miles N.W. of Deadwood, at 3,720′ elevation. The quartz vein about 11″ thick, and shows crystals of galena and pyrrhotite. Two nnels are driven on the vein, each about 150′ long. The vein dips ° S.E. An arrastra, driven by an overshot wheel, is on the property. wis Davis, of Fort Jones, owner.

*Chaingang Mine* (Hydraulic).—This lies 3½ miles S.W. of Callahan, the South Fork of Scott River, at 3,790′ elevation, and comprises 60 res. The property is bonded to the Scott River Mining Co., and is ling prospected by it. Fred Hellmuth, of Callahan, owner.

*Chapman China Mine.*—See Scott River.

*Charter Oak Mine* (Drift).—It is 3 miles N.W. from Hornbrook, tween Rancheria and Ditch creeks, at 2,450′ elevation. The claim ntains 39½ acres on the blue gravel lead, and adjoins the Black Jack. is opened through a tunnel 184′ long; no breasting has been done yet. ater is derived from Ditch Creek. J. W. Lettner, of Hornbrook, ner.

*Charter Oak Mine* (Quartz).—It is situated on the south bank of Cherry eek, 10 miles S.W. from Yreka, at 4,700′ elevation. The vein, about ″ wide, courses N. and S., and dips 45° E., between slate and green- one, carrying a good grade of quartz. Three tunnels, two 100′ and one ′ long, run on the vein, and a 50′ shaft has been sunk above the upper nnel. Two men are employed. D. Barnes, of Yreka, owner.

*Cheng Song Mine* (Placer).—It is on Horse Creek, near Oak Bar, and ploys 3 Chinese.

*China Claims* (Placer).—They are situated on McAdam Creek, where o Chinese companies are working over old diggings; one with 5 and e other with 15 Chinese.

*China Creek Mine* (Hydraulic).—This is on Klamath River, 7 miles ove Happy Camp, at 1,470′ elevation. The bank is from 10′ to 60′ gh, with 5′ to 25′ of gravel. Water is obtained from China Creek. he ditch is 3′x 2′, and 1½ miles long. There are 3,000′ of 11″ and 15″ pe, and two No. 2 giants. The sluices are 800′ long and 24″ wide, ith a 6″ to 8″ grade, and paved with block riffles. Lee & Silva, of n Francisco, owners.

*Chinese Mine* (Placer).—This lies near Cayuse Creek, 6 miles abo the mouth of Humbug Creek, and employs 5 Chinese.

*Clapboard Mine.*—See Finley.

*Classic Hill Mine* (Hydraulic).—It is on Indian Creek, 11½ miles of Happy Camp, and contains 40 acres, at 2,174′ elevation. The ba is 50′ high, and consists of decomposed, slaty bedrock, carrying go Water is taken from West Branch Creek, through 3½ miles of 3′ dit there are 3,000′ of 11″ and 15″ pipe, and two No. 3 giants under 3 pressure. Matthews & Vogan, of Fort Jones, owner.

*Claughry Mine* (Quartz).—It is situated on Eliza's Fork of the Nor Fork of Humbug Creek, 14 miles N.W. from Yreka, at 4,000′ elevati and consists of three full claims, known as the *Blackhawk*, *Hida Treasure*, and *Standard*. They are all on the same vein, about 4′ wi which runs N.E., and dips S.E., between porphyry and serpentine wal Five short inclines have been sunk on the vein, the deepest being 5 there are also four cross-cut tunnels, the longest of which is 225′. Fo men are at work. C. C. Humphreys et al., of Yreka, owners.

*Cleland Mine.*—See Billups.

*Clellands Bar Mine* (River).—It is a claim on the Klamath. Idle.

*Cole & Barton Mines.*—See our XIIth Report, p. 280. Abandoned.

*Collins Mine* (Drift).—It lies on Klamath River, 3 miles below O Bar, at 1,855′ elevation. It is worked by drifting in the bank of t river. D. Collins, of Oak Bar, owner.

*Collins Mine* (River).—It is on Klamath River, 2 miles below O Bar, at 1,885′ elevation. Worked by sluicing in the river. D. Colli of Oak Bar, owner.

*Columbia Mine* (Quartz).—See our XIIth Report, p. 280. It lies Baldy Ridge, 8 miles N.E. of Scott Bar, at 4,950′ elevation. There i 110′ cross-cut tunnel and a 150′ drift on the vein, which is 1′ to 3′ wi dips 15° N., and contains quartz impregnated with sulphurets of ir copper, and lead. A 10-stamp mill, situated on Mill Creek, and driv by water-power, belongs to the claim. Shut down during litigati Columbia Gold and Silver Mining Co., owner; R. Denemier, of S Francisco, agent.

*Commodore Mine* (Quartz).—This is at the head of Barkhouse Cre 13 miles N.E. of Scott Bar, at 3,490′ elevation. The vein is 2′ wi dips 80° W., lies between porphyry walls, and carries about 4% sulph rets; two tunnels, each 60′ long, have been driven on the vein. T double arrastra used to crush ore from this mine is a fine piece work. (See sketch.) It reduces 5 tons of ore per twenty-four hou and cost, complete and ready to run, about $700. It requires 2 m one on each shift, and is driven by a wooden hurdy wheel, 18′ in dia eter, using 30 miner's inches of water, supplied through a 7″ pipe wit 2″ nozzle, under 100′ pressure. The two grinding pits are situat one on each side of the water-wheel, so that its shaft, *L*, transmits t power by pin-wheels (at right angles to each other) to the arras shafts, *H H*. The horizontal pin-wheels, *I I*, have 51 perpendicular ha wood pins, 2″ in diameter, 4″ in length, and set 4″ apart from center center. The pin-wheels, *K K*, are 3′ in diameter, and are built on the wheel-shaft. Each has 13 hardwood pins, 2″ in diameter, 4″ in leng driven in horizontally, 4″ apart from center to center. Both wheels a made of sections of 2″ plank, nailed together and bound with t bands of wagon tire. The ends of each shaft terminate in 3″ ir

DOUBLE

# ARRASTRA

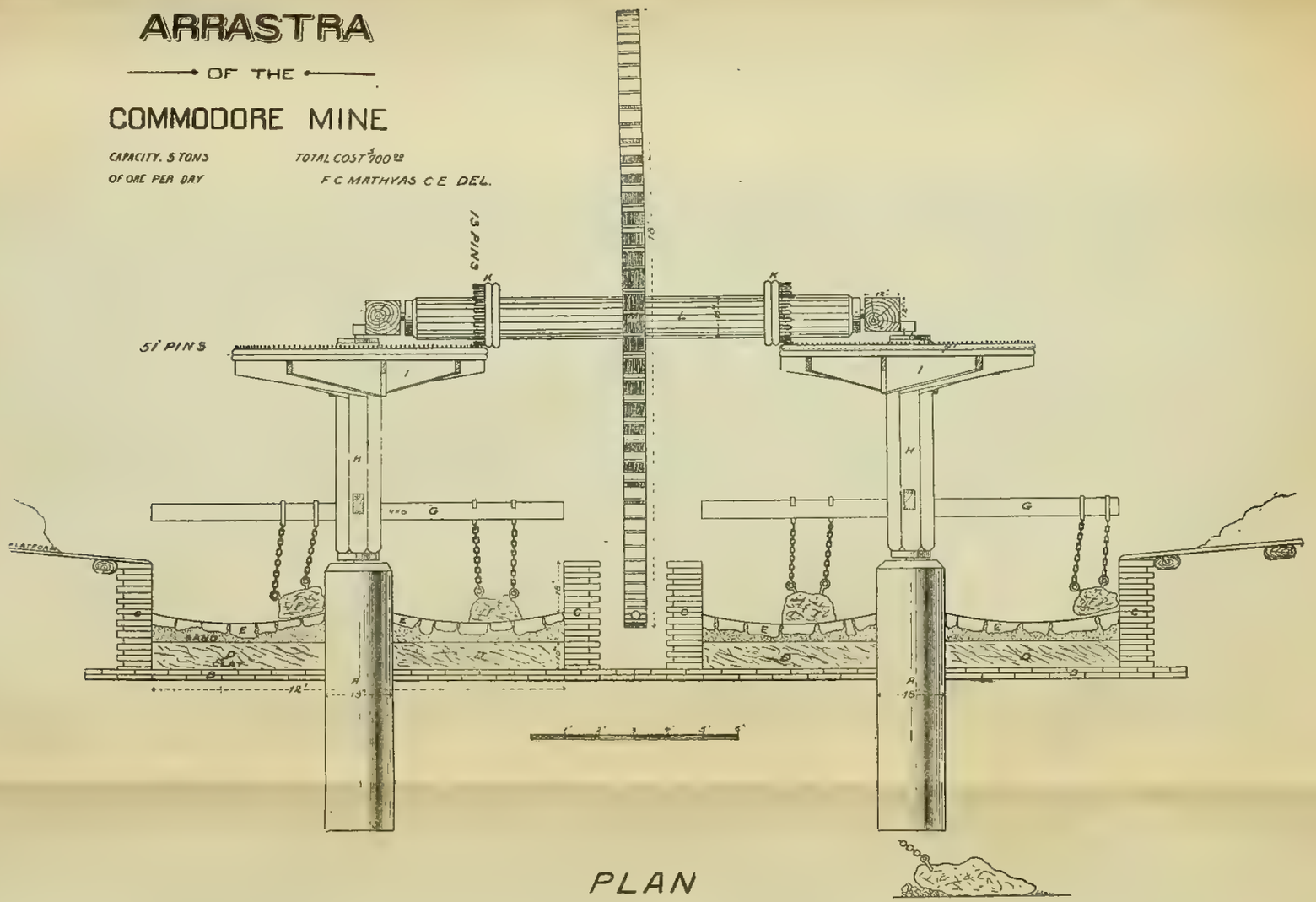
OF THE

## COMMODORE MINE

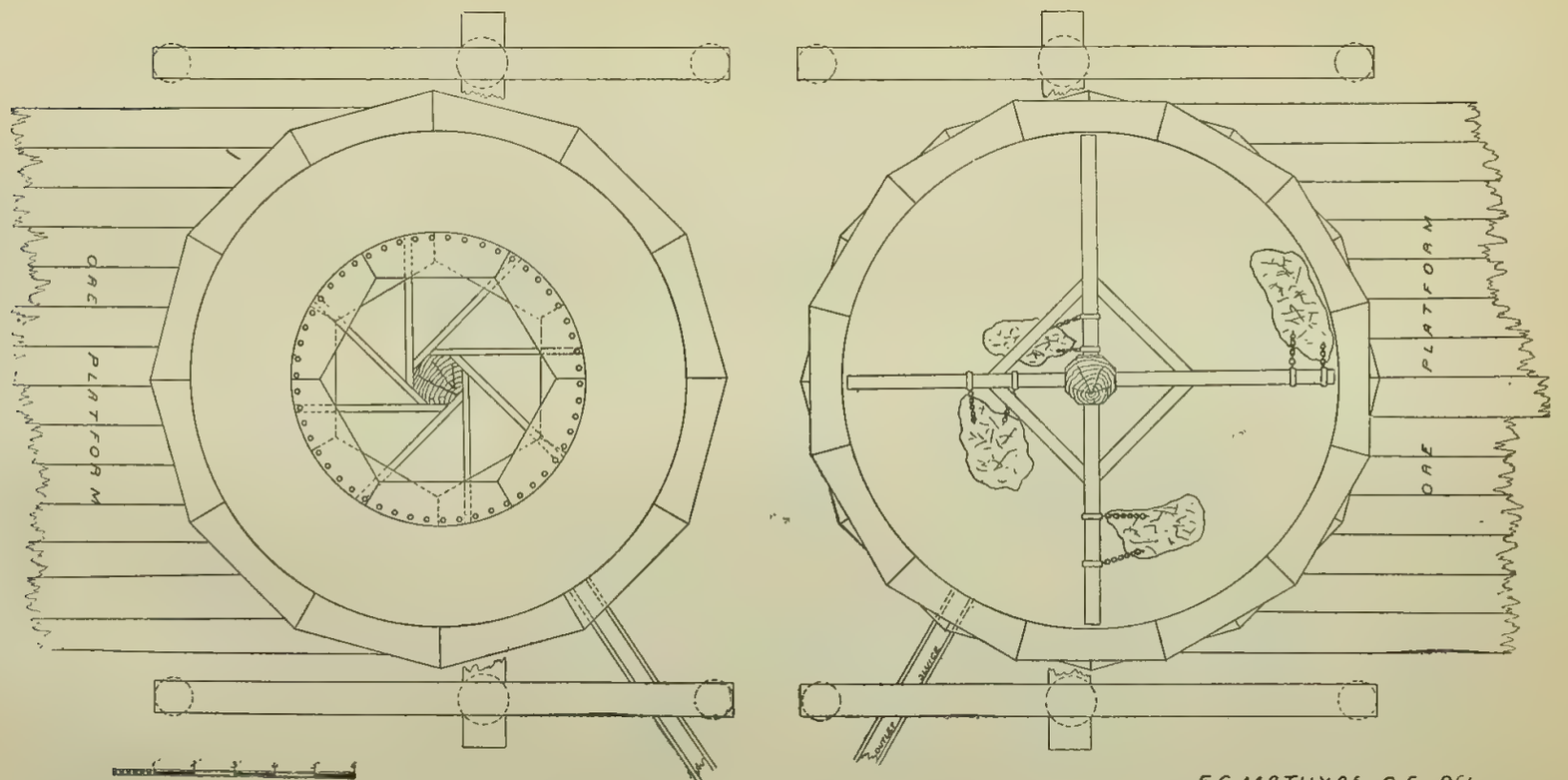
CAPACITY. 5 TONS OF ORE PER DAY

TOTAL COST $700.00

F.C. MATHYAS C.E. DEL.




PLAN

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spindles. Each pit is built as follows: Heart-wood center-post, *A*, 8′ long and 18″ in diameter, is set 4½′ in the ground; around this a double floor, *B*, 16′ square and made of 2″ plank, is laid as a foundation. Next, the circular rim, *C*, 12′ diameter, is built of 2″ plank with broken joints, until the top is 38″ above the floor. In the pit thus formed, moist clay, *D*, is rammed, a thin layer at a time, until it is 10″ thick. Next, a bed of dry, clean sand for the pavement is placed upon the clay. The pavement is made of hard, fine-grained rocks (trap), having at least one nearly flat surface, which are placed as close together as possible and the interstices filled with spawls tightly wedged. The annular pavement, *E*, should be as smooth as possible, and with a depression 4″ deep. The drags or mullers, *F F*, are made of the same rock as the pavement, and weigh from 800 to 1,000 lbs. each. By means of eyebolts, let into the rock, they are hung to the drag-arms, *G G*, by chains. The forward edge of the drag is raised about 1″ to allow it to pass over the material, and the eyebolts are so placed that one corner of the drag is somewhat in advance. As it plows through the pulp, a portion is pushed to one side, directly in the path of the next following drag. The relative position and size of the drags must be such that every part of the pavement is passed over in each revolution. The proper speed is 12 revolutions per minute. The *modus operandi* is as follows: Each charge, consisting of 1¼ tons of ore, broken to the size of a walnut, is gradually shoveled into the pit, water enough being added to make a rather thick pulp when the quartz is pulverized. After 8 hours' grinding (more or less, according to the hardness of the ore), 2 ozs. of quicksilver for every $20 gold in the ore is added gradually. After 2 hours more, the speed is reduced to 4 revolutions per minute, to allow the amalgam to settle, water being added to thin the pulp. After another 2 hours, or when a pan scraped along the bottom does not show any amalgam or quicksilver, the pulp is allowed to pass off slowly into the sluices. The outlet for this purpose is made as follows: A slot 16″ high and 6″ wide is cut through the rim, extending from a point 4″ below the top of the rim to the pavement. This opening is closed by pieces of board 2″ high and sliding in guides. By removing these pieces, one by one, 2″ in depth of pulp can be run off each time. The sluices into which the pulp flows are from 12′ to 24′ long, and the bottom covered with amalgamated plates, riffles, and burlap. When the arrastra is emptied to within 3″ or 4″ of the bottom, the outlet is closed, the speed increased, and a new charge of ore put in. About once a month the paving is taken up and the amalgam collected from the sand below, cleaned and retorted. C. C. Humphrey, of Scott Bar, owner.

*Connor Mine* (Quartz).—This is ¼ mile W. of Oro Fino, near the Last Chance Mine. The ledge is 12″ wide, lies between porphyry walls, and dips 40° S.E. There are two tunnels on the claim, each about 300′ long. Jack Connor, of Oro Fino, owner.

*Consolidated Scywash Mine* (Drift).—It lies on McAdams Creek, 5 miles N. of Fort Jones, and embraces 52 acres of bottom land, two thirds of which has been mined out. The bedrock lies 25′ to 45′ below the surface. H. B. Madison, of Fort Jones, owner.

*Conzetti Mine* (Hydraulic).—See our XIIth Report, p. 280. This is on the South Fork of Salmon River, 8 miles above Summerville, and

contains 20 acres. There are 300′ of 6″ pipe and a No. 1 giant, und 200′ pressure. S. Conzetti, of Cecilville, owner.

*Conzetti Mine* (Hydraulic).—It lies 1 mile W. of Summerville, 2,990′ elevation. Water is taken from Ray Gulch and conveye through a mile of ditch and 200′ of 10″ pipe, to a No. 1 giant. T sluices, 24″x 18″, are 50′ long, and have a 5″ grade. S. Conzetti, Cecilville, owner.

*Coon Mine* (Quartz).—See Schroeder.

*Corey Mine* (Quartz).—See our XIIth Report, p. 280. It is French Creek, 7 miles S. of Etna. The vein is 3′ thick, and is deve oped by two tunnels 150′ and 300′ long. A water-power arrastra b longs to the mine. Louis Corey, of Etna, owner.

*Courts & Smith Mine* (Hydraulic).—This lies on Scott River, miles S. of Scott Bar, on the second bench, at 2,250′ elevation, and co prises 20 acres. Water is taken from the Quartz Hill ditch, throu 300′ of 15″ pipe. There are a No. 3 giant and 300′ of 30″ sluices on t claim. The bank is 80′ high, and shows 15′ of gravel. L. B. Courts al., of Scott Bar, owners.

*Crapo Mine* (Hydraulic).—See our XIIth Report, pp. 280 and 28 This lies 3 miles below Forks of Salmon, at 1,140′ elevation, and co tains 60 acres. The property embraces three locations: *Crapo No. Crapo No. 2*, and *Fort Beyers*. The bank is 60′ high, with 15′ gravel, and the sluices are 400′ long, set on 6″ grade. A 5′ ditch 3 mil long, built on a 19′ grade, conveys water from Crapo Creek, and 1,50 of 11″ and 15″ pipe delivers it to two No. 3 giants, under 200′ pressur Bennett & McLaughlin, of Forks of Salmon, owners.

*Crawford Mine* (Drift).—See our XIIth Report, p. 280. It is at Sco Bar, at 2,050′ elevation. The claim is worked by drifting in the we bank of Scott River. A. Crawford, of Scott Bar, owner.

*Crawley Mine* (Porphyry).—This 1½ miles S.W. of Callahan. Th vein has been traced by a number of surface holes and a tunnel 40′ lon The material exposed is a much decomposed porphyritic rock, carryin gold in paying quantities. George A. Warder and James R. Sears, Callahan, owners.

*Cronin Mine* (Hydraulic).—It lies on the North Fork of Salmo River, 6½ miles W. of Sawyer's Bar, at 2,050′ elevation. Water is co lected from two small gulches by a ditch 1¾ miles long. The bank is 1 high, with 4′ of gravel, and the sluices are 18″x 20″ and 100′ long. Cronin, of Sawyer's Bar, owner.

*Cummings Mine* (Quartz).—See our XIIth Report, p. 280. It is o Boulder Creek, 3½ miles S.W. of Callahan, at 4,400′ elevation. Th vein is from 1′ to 5′ wide, and carries gold in sulphurets. Idle. Thoma K. Cummings, of Callahan, owner.

*Daley Mine* (Placer).—It is in Eddy Gulch, 1½ miles S. of Sawyer Bar, at 2,640′ elevation, and is worked by ground-sluicing. Hugh Dale of Sawyer's Bar, owner.

*David Ledge Mine* (Quartz).—This is at the head of Barkhouse Creel 13 miles N.E. of Scott Bar, at 3,100′ elevation. In a 100′ tunnel an 8 quartz vein is exposed, lying between porphyry walls, and dipping 45 S.E. Idle. P. C. Lange, of Oak Bar, owner.

*Davis Mine* (Quartz).—See Hiyou.

*Deer Lodge Mine* (Quartz).—It lies in White's Gulch, 6 miles S. Sawyer's Bar, at 4,050′ elevation. The vein is 6″ thick. The develop

ents consits of two tunnels, 75′ and 80′ long. Smith & Eveleth, of awyer's Bar, owners.

*Deep Bank Mine* (Hydraulic).—It is on the South Fork of Salmon iver, 23 miles from Trinity Center, at 4,800′ elevation, and contains o locations: one of 20 acres and the other 60 acres. The bank is 200′ gh, and gravel throughout. The water for piping is obtained from outh Fork of Salmon River, through a 2-mile ditch and flume, largely e latter, which is 2′x 2′ with 1″ grade per 12′, carrying 500 miner's ches, delivered under 300′ pressure through 500′ of 11″ pipe to a No. giant. The water season lasts six months. Bank-water is obtained rect from the river through a flume 4′ wide, 3′ deep, and with 1″ grade 12′. The tail-flume contains 15 boxes, 40″ wide, set on an 8″ grade. he gravel is loose, and carries gold from top to bottom, both fine and oarse. Two acres of the ground have been washed off; the dump is to the South Fork of Salmon River. F. J. Abrams and W. B. Blackurn, of Abrams, Trinity County, owners.

*Del Monte Mine* (Quartz).—See Nelson.

*Del Norte Mine* (Hydraulic).—See our XIIth Report, p. 280. This is n Klamath River, 1½ miles above Happy Camp, at 1,385′ elevation. he 6′x 3′ ditch, 10 miles long, was greatly damaged by heavy snow uring 1890, and has not been repaired. The plant of the mine consists f 3,000′ of 11″, 15″, and 20″ pipe and one No. 2 and two No. 3 giants; 30′ pressure is available, and the bank is 35′ high, with 10′ of gravel. ierson Bros., of San Francisco, owners.

*Deming & Gardner Mine.*—See Gardner & Deming.

*Dillon Hill Mine* (Hydraulic).—See our XIIth Report, p. 281. It es on Klamath River, 4 miles below Cottage Grove, at 1,000′ elevation. he bank is 50′ high, with 15′ of gravel; the sluices are 22″ wide and ned with block riffles. There is 1,000′ of 11″ pipe in use, and two No. giants under 200′ pressure. The ditch is 2½′ wide and 5 miles long, nd takes water from Dillon Creek. Dillon Hill Mining Co. (Chinese öperative), of Cottage Grove, owners.

*Doggett Mine* (Hydraulic).—It is 2½ miles above Oak Bar, on lamath River, at 1,965′ elevation. Water is taken from Daggett reek by a 2′ ditch 1 mile long, and 150′ of 10″ pipe. The bank is 50′ igh, with 20′ of gravel, and there is a No. 1 giant under 80′ pressure. here are 800′ of 24″ sluices, paved with Hungarian and block riffles, h a 7″ grade. Louis Doggett, of Oak Bar, owner.

*Dominick Lunn* (Placer).—It is on the Klamath River, in the neighorhood of Gottville. Idle.

*Donovan Mine* (Placer).—This is on Grouse Creek, 5¾ miles E. of allahan, at 4,025′ elevation, and contains 20 acres. Worked by round-sluicing. D. Donovan, of Callahan, owner.

*Doolittle Mine* (Hydraulic).—See Haley.

*Doolittle Mine* (Placer).—It lies on Horse Creek, 15½ miles N.W. of ak Bar, and contains 20 acres, at 2,290′ elevation. It is worked by round-sluicing. Walter Doolittle, of Oak Bar, owner.

*Double Eagle Mine* (Quartz).—It is at the head of Barkhouse Creek, 3 miles N.E. of Scott River, at 2,860′ elevation. The vein is 12″ thick, nd dips 45° S.E. between porphyry walls. There is an inclined shaft, 0′ deep on the ledge. Henry Barton et al., of Oak Bar, owners.

*Dougherty Mine* (Hydraulic).—See our XIIth Report, p. 281. It lies n the North Fork of Salmon River, 4½ miles above Forks of Salmon.

The bank is 30′ high and all gravel, and the 2′ ditch is 1½ miles lon taking water out of Big Creek. There is 600′ of 8″ pipe and a No. giant on the claim. Dougherty Bros., of Sawyer's Bar, owners.

*Douglass Mine* (Hydraulic).—This is on Klamath River, 14 mil below Happy Camp, at 1,140′ elevation, and contains 20 acres. Th small ditch is 1 mile long, and 500′ of 11″ pipe and a No. 2 giant, und 150′ pressure, are used. The bank is 12′ high and all gravel. J. W Douglass, of Happy Camp, owner.

*Duncan Mine* (Drift).—See our XIIth Report, p. 281. This is o Mill Creek, 5 miles E. of Scott Bar, at 2,550′ elevation. Worked b drifting under the bed of Mill Creek. John Duncan, of Scott Ba owner.

*Dundee Mine* (Quartz).—It is on North Fork of Humbug Creek, 1 miles N.W. of Yreka, at 4,000′ elevation. The vein, 6′ wide, trends N and S., and dips 45° E., in porphyritic rock. A 370′ tunnel on th vein and a 60′ winze are the developments. Idle. C. C. Humphreys al., of Yreka, owners.

*Duzel Mine* (Placer).—It lies on Little Humbug Creek, 5 miles E. Walker, at 2,540′ elevation. Worked by ground-sluicing. Peter Knu son et al., of Walker, owners.

*East Fork Ledge Mine* (Quartz).—It lies on East Fork, 5 miles E. Callahan. A shaft 15′ deep, and an open cut 10′ long, expose decompose auriferous rock. Welker & Schneider, of Callahan, owners.

*Eastlick Bros. Mine* (Hydraulic).—See our XIIth Report, p. 28 This lies at Oro Fino, at 2,925′ elevation, and contains 60 acres. Wat is conveyed to the mine by two ditches. The *Eastlick Lower* ditch take water from Kidder Creek, and is 4½ miles long, 6′ wide, and 3′ deep. Th *Eastlick Bros.* ditch is 7 miles long, 4′ wide, and 3′ deep. Both have 13′ grade. The combined capacity is about 3,000 miner's inches. Th bank, 35′ high, with 20′ of gravel, is being piped away by two No. 1 giant under 300′ pressure. The sluices are 24″ wide, set on a 3½″ grade, an have block riffles. The gravel after leaving the sluices is raised by hydraulic elevator some 30′ to the surface, whence it flows to the wast dump through a 5′ flume, 2,000′ long; 2,500′ of 6″, 8″, and 15″ pipe is i use in the mine. The gold is fine, and lies mostly on the slate bedroc The mine runs night and day, light being furnished by a small, 5 H.P electric plant run by water-power. The season lasts from four to fiv months, and during that time nearly an acre of bedrock is cleaned up Eastlick Bros., of Oro Fino, owners.

*E. D. M. Mine* (Quartz).—See Saint Lawrence.

*Eli Mine* (Quartz).—It is 4½ miles W. of Yreka, and comprises thre full claims on a N.E. vein, with an average width of 3½′ of an ocher ore, dipping about 50° S.E. between slate foot-wall and porphyry hang ing-wall. The developments consist of a 250′ tunnel on the vein and 50′ winze; exposing a vein from 2′ to 6′ wide. A second tunnel, 50 lower, is 120′ long, and cross-cuts the vein 6′ without reaching the wal The ground is heavy, requiring solid timbering; the quartz carries abou ½% of sulphurets, mostly iron. A water-right of 200 inches near th forks of the creek, for the mill site, gives 20′ pressure with 900′ of ditc and 250′ of flume. Three men are at work. O. H. Lawson, of Yrek owner.

*Elk Creek Bar Mine* (River).—See our XIIth Report, p. 281. Thi lies on Klamath River, ½ mile below Happy Camp, at 1,300′ elevatio

is an old bar in the river. The upper part of the gravel is piped off, nd the rest is raised by derrick to the sluices. The bedrock is black ate, and lies 10′ below low-water level. An overshot wheel, 24′ in iameter, runs the derrick, and another one, 9′ in diameter, furnishes ower for the pump. The latter is of the Chinese pattern, 18″ wide and ′ deep; the belt is rubber and the cups are wood. A 3′x 2′ ditch, 1½ iles long, furnishes water for power and for a No. 2 giant, and 500′ f 11″ pipe, with a pressure of 40′, is made use of. Mann Co. (Chiese coöperative), of Happy Camp, owner.

*Elliott Diggings Mine* (Hydraulic).—See our XIIth Report, p. 281. It on Klamath River, 1½ miles above Cottage Grove, at 1,110′ elevation, nd contains 80 acres. Water is taken from Swelip Creek through a 2½′ itch, 2½ miles long; 750′ of 11″ pipe, and a No. 2 giant under 200′ ressure, are used, although 500′ pressure may be had if desired. The uices are 22″ wide, have block riffles, and an 8″ grade. The bank 200′ high, and has 30′ of gravel on the slate bedrock. Elliott Bros., f Cottage Grove, owners.

*Empire Mine* (Quartz).—See our XIIth Report, p. 281. It is at the outh of Empire Creek, 2 miles N. of Gottville, at 2,500′ elevation. here are six locations in the claim, with two veins running N.E. and .W. and E. and W., respectively. The country rock is serpentine and late. The larger of the two veins is 4′ in width and of low grade. here are four tunnels, 400′, 130′, 260′, and 100′ in length, and three hafts—one vertical, 90′, and two inclines, 200′ and 50′, respectively. 5-stamp mill (idle) is driven by water-power, derived from Empire reek, through a short ditch, giving 125′ fall on a 3′ Pelton wheel. leven men are employed. C. Yunker, of Yreka, owner.

*Enterprise Mine* (Hydraulic).—This lies on Wildcat Creek, 5 miles V. of Callahan, at 3,980′ elevation, and contains 1,600 acres. After ying idle for some time they were, in 1895, getting the mine in shape o work on a large scale. The 5-mile ditch, which takes water from rizzly Gulch, has been cleaned out, and 2,500′ of 15″ pipe and a No. giant are on the ground. The gravel bank is 100′ high, and 350′ ressure is available. Fred Beaudry, of Callahan, owner.

*Espey Mining Co.'s Mine* (Hydraulic).—It is 4 miles N. of Yreka, at ,500′ elevation, and consists of several claims flanking the Yreka Flats hat have not hitherto been worked, on account of the great expense of ringing in water. The total area to be worked is 200 acres. Water as been obtained by extending the canal of the electric light works, hich is taken out of Shasta River near Yreka, until a fall of 32′ was btained, which was applied on two Knight wheels, 4′ 8″ in diameter, hrough two 44″ pipes supplied with nine 4″ to 6″ nozzles. The wheels ake 93 revolutions per minute and develop 229 H.P., with which the ater is raised 432′ by means of a Pittsburg hydraulic pump. The anal starts from the Shasta River with a width of 24′, but narrows down o 14′, and on the Espey portion, which is ½ mile long, to 12′ with a depth f 4′, and a grade of ⅜″ to the rod. The entire capacity of the canal is ,000 inches of water, the Espey Co. taking 5,500 inches. The intake pipe f the pump is 14″ in diameter and the discharge pipe 12″. The pump s supplied with 6 valves to every cushion; has a 2′ stroke and sustains pressure of 9.08 tons on the 15″ plunger. The water is delivered into 16″x 18″ flume, ¾ mile long, with the same grade as the canal. From 50 to 165 inches of water are thus delivered to the top of the hill. In

the gravel-cut the water is delivered under 165′ head. The foundation of the pump are on bedrock 6′ below the river-level, and are, altogethe 11′ thick. The water-pipes are ½″ thick, and weigh 1,250 lbs. per join The gravel bank is from 12′ to 35′ high, with free gravel, containin coarse black gold throughout. Ten men were employed getting th plant ready for washing. One quarter of a mile of 2′x 16″ tail-flum with slat riffles, will be used. An incorporated company, of Yrek owner.

*Evening Star Mine* (Quartz).—It is at the head of Eddy Gulch, miles E. of Sawyer's Bar. Idle. John Daggett, of San Francisco, owne

*Everill Mine* (Drift).—See our XIIth Report, p. 281. This is o Klamath River, 4 miles below Hamburg Bar, at 1,710′ elevation. Th claim is worked by drifting in the second bench. John H. Everill, Hamburg Bar, owner.

*Excelsior Mine* (Hydraulic).—See our XIIth Report, p. 281. Worke out and abandoned.

*Extension of Siskiyou Mine* (Quartz).—See Great Northern.

*Fabricius & Rider Mine* (Hydraulic).—See our XIIth Report, p. 291 It is situated on Little Humbug Creek, 4 miles S. of Walker, at 2,10 elevation, and contains 40 acres on a former bench of the creek. Th gravel is tight, requiring the use of powder. The cut is 30′ deep, 6 wide, and 150′ long. The gold is coarse and found principally near th granitic bedrock. Fifty inches of water for piping is taken from Littl Humbug Creek and its north fork through 2 miles of ditch and deliv ered, under 80′ pressure, through 300′ of pipe. There are 200′ of 10″x 12 sluices, lined with pole riffles. Two men are at work. Fabricius & Rider, of Walker, owners.

*Fagundez Mine* (Quartz).—See Ampback.

*Fagundez Mine* (Placer).—See our XIth and XIIth Reports, pp. 432 an 281. It is on McAdams Creek, 11 miles N. of Fort Jones, and embrace about a mile of creek bed, 300′ to 400′ wide. The gravel is from 15′ t 35′ deep, and contains many large bowlders. They are hoisted out b a derrick driven by an overshot wheel. The sluices are 30″ wide an paved with block riffles. The water season lasts from about Februar 15th to July 15th. The mine is said to be the richest in that part of th country. Manuel Lial et al., of Yreka, owners.

*Fair Mine* (Placer).—It lies on the ridge between the main Wild Ca Creek and South Fork, 5½ miles W. of Callahan, and contains 80 acre Water is brought from South Fork by a mile of 2′x 2′ ditch and 1,10 of 8″ siphon pipe; 400′ of 30″ sluices is used. There is no pressur J. D. Heard et al., of Callahan, owners.

*Falcon Mine* (Quartz).—It is on the North Fork of Humbug Creek 11 miles N.W. of Yreka, at 3,400′ elevation. The vein is 9″ wide, trend N.W. and S.E., and dips vertically in a granitic formation. A 4′x 6 shaft is 25′ deep. A cross-cut tunnel is being driven to cut the vein a 75′ depth. Two men are employed. T. E. Williams, of Yreka, owne

*Finley Mine* (Hydraulic).—See our XIIth Report, p. 282. It is at th mouth of Eddy Gulch, 1 mile S. of Sawyer's Bar, at 2,550′ elevation The property embraces the following three locations: *Clapboard*, *Gol Nugget*, and *Slapjack*. Water is furnished by two flumes; the on from Eddy Creek is 1¼ miles long, 2½′ wide by 1½′ deep, and has grade of 12.8′ per mile; the other, 1 mile long, is 3′ wide by 14″ deep and has a grade of 9.6′ per mile. They deliver the water under 200′ an

)' pressure, respectively; 600' of 12" pipe and two No. 1 giants are used. he sluices are 30" wide and have a grade of 9" per box. S. L. Finley Sons, of Sawyer's Bar, owners.

*Flag Mine* (Quartz).—It is on Sucker Creek, at 3,600' elevation. The ein is 30" wide, courses N. and S., and dips about 80° E., in granorite. It is being prospected by open cuts, by two men. — McIntyre, Yreka, owner.

*Foley Mine* (Hydraulic).—See our XIIth Report, p. 282. This is on ie North Fork of Wildcat Creek, 5½ miles W. of Callahan, at 4,020' evation. Water is taken from Wildcat Creek by a 2'x 2' ditch, 1½ iles long. The bank is 25' high, and is all gravel; the sluices are 24" ide; 1,500' of 8" and 11" pipe and a No. 1 giant, under 200' pressure, e used. G. H. Hayes, of Callahan, owner.

*Forks (McNeals') Mine* (Hydraulic).—See our XIIth Report, p. 287. is at Forks of Salmon, at 1,325' elevation, and contains 50 acres. The itch, taking water from McNeal Creek, is 1 mile long and 3' wide, and as a grade of 19.2' per mile. The sluices are 36"x 32" and paved with locks; the bank is 30' high, and all gravel. There are 1,000' of 11" and 5" pipe on the claim and two No. 2 giants, working under 200' pressure. V. P. Bennett, of Forks of Salmon, owner.

*Fort Beyers Mine* (Hydraulic).—See Crapo.

*Fort Gough Mine* (Hydraulic).—See our XIIth Report, p. 282. It is n Klamath River, 5 miles below Seiad, at 1,600' elevation. The 3' ditch, king water from Gough Creek, is 1½ miles long. The bank is 100' high, ith 30' of gravel. The sluices are 28" wide and 600' long; 3,000' of 11" ipe delivers the water to a No. 2 giant, under 140' pressure. Large ocks are removed by a water-power derrick. Dean & Burns, of San rancisco, owners.

*Fort Jones Mine* (River).—It is 1 mile below Gottville, at 2,000' pproximate elevation, and is a river wing-dam claim worked by Chinese, ith the use of four wheels; one for pumping, one for hoisting, and two ip-wheels. A derrick, with a 70' boom and driven by water-power, is sed. There are 150' of sluices on an 8" grade, paved with wooden blocks. Chinese company, of Gottville, owner.

*Fortune Mine* (Hydraulic).—See our XIIth Report, p. 282. Abandoned.

*Fouch Mine* (Hydraulic).—See Scott River.

*Frank Mine* (Placer).—It is at the mouth of Eddy Creek, 1¼ miles S. f Sawyer's Bar, at 2,520' elevation. It contains 10 acres. Idle. Manuel ischer, of Redding, Shasta County, owner.

*Franks & Moncton Mine* (Quartz).—See Osceola.

*Frank Perry Mine* (Placer).—It is about ½ mile N.E. of Hawkinsville, djoining the Espey Mine, at 2,200' elevation, and contains 20 acres. Under the present conditions only 6' to 8' of bank can be worked by round-sluicing, on account of the lack of grade; 6' of gravel has not een bottomed, and will have to be elevated. Water is obtained from ie Espey Mine; the tailings dump into Yreka Creek. Two men are mployed. Manuel Dutra and Frank Perry, of Hawkinsville, owners.

*Frazer Mine* (Placer).—It lies on Eddy Gulch, 3¾ miles S. of Sawyer's ar. Worked by ground-sluicing. Joe Frazer, of Sawyer's Bar, owner.

*Galena Mine* (Quartz).—It is situated on the divide between Sucker reek and the Middle Fork of the Humbug, 12 miles N.W. from Yreka. he vein trends N. and S., and dips 35° E., in porphyry and limestone ormation. A 100' tunnel has been driven on the vein, and the ground

above stoped to the surface. Two men are at work. J. N. Coulson ar A. E. Thrash, of Yreka, owners.

*Gardner & Deming Mine* (Hydraulic).—It is at Oro Fino, at 3,13 elevation, and contains 31 acres of gravel, 20′ deep. Water is take from Kidder Creek by a ditch 11¼ miles long, 3½′ wide, and 18″ dee which crosses the Muggsville Divide by a 22″ inverted siphon, 1,90 long and under 200′ pressure. About 1,000 inches of water is delivere to a No. 2 giant, under 240′ pressure, through 1,400′ of 8″ pipe. Th sluices are 600′ long and 24″ wide, paved with block riffles, and have grade of 5″ per box. Large lanterns are used at night. S. R. Gardn et al., of Oro Fino, owners.

*Gardner & Deming Mine* (Quartz).—It is ½ mile N.W. of Oro Fin S. R. Gardner et al., of Oro Fino, owners.

*Gausney Mine* (Placer).—This is on Klamath River, 2½ miles belo Oak Bar, at 1,870′ elevation. Idle. J. Gausney, of Oak Bar, owner.

*Gee Wah Mine* (Drift).—See Hardscrabble.

*Gerhart Mine* (Hydraulic).—See our XIIth Report, p. 282. It lies o Horse Creek, 12 miles N.W. of Oak Bar, at 2,080′ elevation, and contair 40 acres. A 1½″ nozzle on 150′ of 6″ hose is supplied with water, fro Fish Gulch, by a 2′ ditch, ¾ of a mile long. The bank is 12′ high, an all gravel; the sluices are 100′ long, 12″ wide, and have Hungaria riffles. J. Gerhart, of Oak Bar, owner.

*Gerkin Mine* (Placer).—This lies on the South Fork of Salmon Rive 7 miles below Cecilville. It is worked by ground-sluicing, water bein taken from Butcher Gulch. George Gerkin, of Cecilville, owner.

*Gibson Bar Mine* (Placer).—It is on the Klamath River in the vicinit of Gottville. Idle.

*G. Knichts' Mine* (Placer).—See Kee Hong.

*Golden & Eveleth's* (*Brown Bear*) *Mine* (Quartz).—See our XIIt Report, p. 283. It lies on Eddy Ridge, 6 miles S.E. of Sawyer's Bar, a 4,700′ elevation. The vein averages 4′ in thickness; lies between po phyry and slate, and dips 45° to 70° N. The mine is worked throug two tunnels, 165′ and 450′ long, connected by a winze. The ore-sho is 175′ long, and the ore contains about 1% of sulphurets. A 4-stam water-power mill belongs to the claim; the stamps weigh 750 lbs. an drop 7″, 90 times per minute. Power is obtained from a 6′ hurdy whe under 165′ pressure. Frank Golden et al., of Sawyer's Bar, owners.

*Golden Ball Mine* (Quartz).—See our XIIth Report, p. 282. It is a the head of Eddy Gulch, 5 miles S. of Sawyer's Bar, at 4,300′ elevatio The vein of ribbon quartz averages 4′ and lies between slate wall and dips 150° E. The mine is worked through four tunnels, each fro 400′ to 600′ long, which are driven on the vein, 80′ to 120′ apart. A old 20-stamp mill belonging to the mine is nearly worn out, and is t be replaced by a new one in the near future. Golden Ball Mining Co owner; A. Ball, of Sawyer's Bar, superintendent.

*Gold Note Mine* (River).—It is situated in the Klamath River, miles W. of Henley, at 2,100′ approximate elevation, and compris 1,500′ along the course of the river. A wing-dam, 100′ and over i length, with end dams of about the same length, make a bank of 10 available, with 20′ gravel next the bedrock. Two river wheels, 14′x 1 and 16′x 15′, furnish the power for pumping and hoisting, while a sma wheel, run by the seepage water, drains the depression in the bedroc The gravel is free, and two drifters take out 12½ tons per shift (25 tu

1,000 lbs. each). The gravel last season yielded an average of 75 nts of coarse gold per cubic yard, by washing through 100′ of 16″ nices set on a ½″ grade. The water-power derrick has a sweep of 75′ d a lifting capacity of several tons. Four men are employed. D. rn, of Hornbrook, owner.

*Gold Nugget Mine* (Hydraulic).—See Finley.

*Gold Run Mine* (Quartz).—See Hungry Hill.

*Goodenough Mine* (Quartz).—It lies at the head of Barkhouse Creek, miles N.E. of Scott Bar, at 3,210′ elevation. There are two tunnels the claim, 50′ and 96′ long, and a winze 20′ deep. The vein is 6′ to wide, and dips 83° E. An arrastra is used to reduce the quartz. C. Humphrey et al., of Scott Bar, owners.

*Goodenough Mine* (Quartz).—See Spencer.

*Goodwin Mine* (Hydraulic).—It is on Klamath River, 11 miles below ttage Grove, and contains 120 acres, lying at 920′ elevation. Water taken from Sandy Bar Creek by a 2′ ditch 3 miles long; 300′ of 8″ pe and a No. 1 giant, under 100′ pressure, are used. The bank is 40′ gh, with 10′ of gravel. The sluices are 24″ wide. Frank Goodwin et , of Cottage Grove, owners.

*Gordon Mine* (Hydraulic).—See our XIIth Report, p. 283. It is on lamath River, 5½ miles above Happy Camp, at 1,440′ elevation. The nk is 30′ high, and all gravel; the sluices are 24″ wide and have a ade of 6″ per box; 2,500′ of 11″ pipe and a No. 2 giant are in use. ie ditch from Horse Creek is 2½′ wide by 2′ deep, and 3 miles long—arly all flume. A water-power sawmill is on the claim. C. Gordon, Happy Camp, owner.

*Grattan Mine* (Quartz).—See Last Chance.

*Great Northern* (*Extension of Siskiyou*) *Mine* (Quartz).—It is on the iddle Fork of Humbug Creek, 6½ miles N.W. from Yreka, at 2,900′ evation. The vein averages 2′ in width, trends N. and S., and dips ° E., between porphyry walls. The only development on this idle ine is a 6′x 10′ double-compartment shaft, 40′ deep. F. Kelly, A. aines, D. McCook, and J. J. Ferrier, of Yreka, owners.

*Green Mountain Mine* (Quartz).—This is in Hull Gulch, a tributary Quartz Valley, at 3,220′ elevation. The vein is 12″ thick, lies tween porphyry and diorite, and dips 60° S.E. The mine is worked rough a cross-cut tunnel 1,000′ long, and a winze 200′ deep. Power ills are used. At the mouth of the tunnel are an air-compressor and 5-stamp mill. Howard Lewis, of Fort Jones, superintendent.

*Grider Mine* (Hydraulic).—This is on Klamath River, 2 miles below appy Camp, and contains 160 acres, lying at 1,350′ elevation. Water taken from Grider Creek through a ditch 2 miles long and 6′ wide; 000′ of 15″ and 20″ pipe is used. The bank is 60′ high, with 10′ of avel. One No. 1, two No. 2, and one No. 3 giant are used, under 100′ essure. The sluices are 24″ wide, and have a grade of 4½″ per box. Chinese coöperative company, owner; Ah Ock, of Happy Camp, anager.

*Grider Mine* (Hydraulic).—It lies on Klamath River, 1 mile above iad, at 1,720′ elevation. The ditch is 4½′ wide by 2′ deep, is 4½ miles ng, and has a grade of 12.8′ per mile; 1,600′ of 11″ to 20″ pipe and a o. 3 giant, under 100′ pressure, are used. The bank is 90′ high, with 5′ of gravel; the sluices are 250′ long and 24″ wide, and have a grade 6″ per box. W. T. Grider, of Seiad, owner.

*Gum Boot Mine* (Quartz).—This is at the head of Mill Creek, 9 mi E. of Scott Bar, at 4,400′ elevation. The vein is from 4′ to 6½′ thi lies between walls of blue slate, and dips 40° S.W. The developme consist of an incline shaft 35′ deep and a tunnel 80′ long. A sled-rc is under construction to connect the mine with the wagon-road. T ore contains some sulphurets, galena, and chalcopyrite. C. E. Hu phrey et al., of Scott Bar, owners.

*Hadloff Mine* (Quartz).—It lies at the head of Barkhouse Creek, miles N.E. of Scott Bar, at 3,150′ elevation. There is an incline sh 35′ deep and a tunnel 15′ long. The vein is 2′ thick and dips 45° C. E. Humphrey, of Scott Bar, owner.

*Haley Mine* (Hydraulic).—It is on Klamath River, 10 miles bel Happy Camp, and contains 40 acres, lying at 1,540′ elevation. Wa is conveyed from Daggett Creek by a 2½′ ditch, 3 miles long, a delivered through 400′ of 11″ pipe to a No. 2 giant acting against a gravel bank, under 175′ pressure. The sluices are 20″ wide, have an grade, and are paved with block riffles. M. Doolittle, of Happy Can owner.

*Halstead Mine* (Hydraulic).—It is on Klamath River, 10 miles bel Happy Camp, at 1,530′ elevation. It adjoins the Haley Mine and worked by the same plant. M. Doolittle, of Happy Camp, owner.

*Halvorson Mine* (Hydraulic).—This is on both sides of Klama River, 17 miles below Cottage Grove, and contains 180 acres, lying 860′ elevation. On the *left* bank, water is brought from Irvin Creek a ditch 4′ wide and ½ mile long; 500′ of 8″ and 11″ pipe and a No. 1 a a No. 2 giant, under 65′ pressure, are used. The bank is 20′ high, wi 7′ of gravel, and the sluices are 24″ wide. On the *right* bank, water taken from Haywood Creek through a 2½′x 2′ flume, 1¼ miles long. No. 1 giant, under 160′ pressure, and 1,000′ of 8″ and 11″ pipe are us The gravel bank is 30′ high and the sluices 20″ wide. A. Halvorson, Cottage Grove, owner.

*H. & M. Mine* (Hydraulic).—It is on the South Fork of Scott Riv 2 miles S.W. of Callahan, at 3,625′ elevation. It lies on the seco bench, 50′ above the river. The bank is 75′ high, with 25′ of gravel, a rests on slate bedrock. The ditch is 3 miles long, 2′ wide, and has a gra of 25.6′ per mile. The water is conveyed to the No. 2 giant under 2 pressure, through 700′ of 8″ pipe. Welker Bros. & Barr, of Callaha owners.

*Hanson Mine* (Placer).—See our XIIth Report, p. 284. It lies 4 mi above Somes Bar, on Salmon River, and is worked by ground-sluici W. H. Bowersox, of Somes Bar, owner.

*Hardscrable Mine* (Drift).—This lies on McAdams Creek, 4½ mi above Fort Jones. This mine was supposed to be worked out, and aba doned in 1885. Since then a Chinese company has taken hold of t property, and seems to be doing well. Its outlet is through the O Grove Mine adjoining, and pumps are unnecessary. Gee Wah Co., Etna, owner.

*Hardscrabble Mine* (Drift).—This is on Mill Creek, a tributary Quartz Valley. Idle. E. Erno, of Oro Fino, owner.

*Harris Mine* (Hydraulic).—Sold to and included in the Salmon Riv Mine.

*Hart Mine* (Placer).—See our XIIth Report, p. 284. It lies on Crai Gulch, 6 miles W. of Callahan, and is worked by ground-sluicir Charles Hart, of Callahan, owner.

*Hartstan Mine* (Quartz).—This is on French Creek, 7 miles S. of na. The improvements consist of two tunnels, 300′ and 400′ long, l a 5-stamp water-power mill. The vein is 2′ thick. Idle. George Hartstan, of Etna, owner.

*Hayslip Gulch Mine* (Placer).—It lies on the East Fork of Scott ver, 4 miles E. of Callahan, and embraces 20 acres. A ditch 4 miles g and 2′ wide brings water from Grouse Creek. Worked by ground-icing. L. Schneider, of Callahan, owner.

*Heard & Henry Mine* (Placer).—It is on Smith's Gulch, 3½ miles V. of Callahan. After lying idle for some years, the claim is being tted with a plant for ground-sluicing. M. W. Loveridge, of Calla-n, owner.

*Hegler Mine* (Quartz).—It is on Lawson's Gulch, 12 miles N.W. from eka, at 3,800′ elevation. The vein varies from 6″ to 6½′ in width, irses N.E. and S.W., and dips about 70° E., between slate and por-vry walls. It has been opened by three tunnels about 80′ apart; lowest one is a cross-cut 180′ long, with 720′ of drifts on the vein; the er two are driven 300′ and 100′, respectively, on the vein. The ore-ots pitch to the S.E. The ore is reduced in a 5-stamp steam-mill, h 600-lb. stamps, run by an 8 H.P. engine, crushing 1 ton per stamp day, when dropping 5½″, 100 times per minute, and discharging ough a No. 8 slot screen. The aprons are set on a grade of 1½″ per t; the sluice-plates at 1¼″. Four men are employed. Hegler & lrich, of Yreka, owners.

*Hibernia Mine* (Quartz).—See Ninety.

*Hickey Mine* (Hydraulic).—It is on North Fork River, 6 miles below wyer's Bar, at 2,100′ elevation, and contains 20 acres. Water is taken m small gulches by a ditch 1¼ miles long, and delivered through 500′ 15″ pipe to a No. 2 giant, under 200′ pressure. The claim lies on the ond bench, and is supplied with 200′ of 24″x 24″ sluices. Frank ckey, of Sawyer's Bar, owner.

*Hickey Bros.' Mine* (Hydraulic).—See our XIIth Report, p. 284. It s on North Fork River, 2½ miles below Sawyer's Bar, at 2,275′ eleva-n. About 1¼ acres were cleaned up during the season of 1894–95. ckey Bros., of Sawyer's Bar, owners.

*Hickox Mine* (Hydraulic).—It is on Klamath River, 15 miles below ttage Grove, at 900′ elevation. The bank is 30′ high, and the gravel ; the sluices are 24″ wide, and paved with block riffles. A No. 1 nt, under 50′ pressure, is supplied by 150′ of 8″ pipe. Water is ught from Sandy Bar Creek by 2½ miles of 2′ ditch. Charles Hickox, Cottage Grove, owner.

*Hidden Treasure Mine* (Quartz).—See Claughry.

*Highland Mine* (Quartz).—This lies on Trail Creek, 14 miles S.W. Callahan, and is developed by a tunnel 200′ long and a shaft 100′ p. The vein is 4′ thick and dips 45° N.W. A 2-stamp water-power ll is on the premises. J. B. Fort et al., of Callahan, owners.

*Hiyou (Davis) Mine* (Quartz).—It is on the hill ½ mile N.W. from adwood. The vein averages 12″ in thickness, and the ore shows cks of zinc-blende, galena, and pyrite. The developments consist of ee tunnels, 70′, 80′, and 240′ long, respectively, which are connected winzes for air. The ore is sledded down the hill to an arrastra in adwood Gulch, which is driven by a 20′ overshot wheel.

*Hiyou Gulch Mine* (Hydraulic).—This lies at the mouth of Hiy Gulch, 9 miles N. of Fort Jones. The ditch is partly destroyed, a the mine is idle. Estate of Mrs. Noah Williams, of Callahan, owner.

*Hoboken Mine* (Quartz).—See our XIIth Report, p. 284. It lies Cherry Creek, 11 miles N. of Fort Jones, at 4,500′ elevation. T vein is a dark-colored ribbon quartz, from 6″ to 6′ thick, and d about 35° N.W. The mine is developed by three cross-cut tunnels a drifts; No. 1 is 67′ long, and drifts 500′ long on the vein. All the above this level is stoped. Tunnel No. 2 is 500′ long, and is 290′ lov than No. 1 tunnel. When the vein was struck, water came in in su quantities that work was suspended. Tunnel No. 3 was then star 100′ lower down to drain the mine, and is about 100′ long. Idle. Her J. Diggles, of Fort Jones, owner.

*Hock Mine* (Drift).—This is on Indian Creek, 5 miles N. of Fort Jon at 3,100′ elevation. The claim contains 20 acres, and is being drift from the bottom of a 3½′x 4′ shaft, 60′ deep. The gravel is hoisted horse-whim. Hock Co. (Chinese coöperative), of Fort Jones, owner.

*Hock Him Mine* (Drift).—It lies on Indian Creek, 4 miles N. of F Jones, at 3,000′ elevation. The bedrock lies 65′ below the surface. T mine embraces 20 acres, and is worked in the same manner as the Hc Mine, which it adjoins. Hock Him Co. (Chinese coöperative), of F Jones, owner.

*Horn (Bennett) Mine* (Hydraulic).—This is at the Forks of Salm River, and contains 40 acres, lying at 1,325′ elevation. The bank is high, and has 15′ of gravel. Water for ground-sluicing is taken fr Horn Gulch by a ditch ½ mile long. W. P. Bennett, of Forks of Salm owner.

*Horse Creek Mine* (Hydraulic).—This lies on Horse Creek, 11 mi N.W. of Oak Bar, at 2,140′ elevation, and contains 310 acres, includi the old *Bret*, *Lacy*, and *Barton* claims. The company has lately be organized, and the plant will be ready to work during the season 1895–96. The ditch, taking water from a branch of Horse Creek, is wide by 2′ deep, and 4½ miles long, with a grade of 6.4′ per mile. T bank is from 20′ to 100′ high, and all gravel. Water is delivered throu 600′ of 11″ pipe to a No. 2 giant, under 225′ pressure; the sluices a 36″ wide, and are set on a grade of 11″ per box. Horse Creek Mini Co., owner; P. C. Lange, of Oak Bar, superintendent.

*Horse Creek Mining Co.'s Mine* (Hydraulic).—It is situated on t Klamath River, near Oak Bar, and contains 340 acres of placer grou on an ancient channel 150′ above the present bed of Horse Cre This channel is 120′ wide, covered with 10′ of top soil, heavily timbere the lower 8′, of gravel, resting on the slate bedrock, carries coarse go Twelve hundred inches of water is taken from Horse Creek, through miles of ditch, and delivered to two giants, with 3″ and 4″ nozzles, unc 250′ pressure. The 3′x 3′ tail-flume is 200′ long, paved with 12″ wood blocks, and set on a grade of 8″ to the box. Twelve men are employ working in two shifts. P. C. Lange et al., of Yreka, owners.

*Hossick & Brown Mine* (Quartz).—See Old Vet and Eclipse.

*Hourigan Mine* (Placer).—This is on Klamath River, ½ mile abo Hamburg Bar, at 1,840′ elevation, and is worked by ground-sluicin M. Hourigan, of Hamburg, owner.

*Howard Mine* (Placer).—It is on Indian Creek, 12 miles N. of Hap Camp, at 2,250′ elevation. The claim contains 20 acres, and is work by ground-sluicing. S. E. Howard, of Happy Camp, owner.

*Hubbard Mine* (River).—See our XIIth Report, p. 285. It lies in the d of Klamath River, 2 miles above Oak Bar, at 1,950′ elevation. drock lies 10′ below water-level. Two water-wheels, furnishing power the derrick and the pumps, are driven by the river current. The ffer-dams inclose about ½ acre. Jesse Hubbard, of Oak Bar, owner.

*Hubbard Mine* (Placer).—It lies on Horse Creek, 14½ miles N.W. of k Bar, at 2,250′ elevation. The claim contains 40 acres, and is rked by ground-sluicing. W. H. Hubbard, of Oak Bar, owner.

*Huey Mine* (Hydraulic).—It is on Indian Creek, 13 miles N. of appy Camp, at 2,375′ elevation, and contains 40 acres. Water is taken m Mill Creek by a 2′x 2′ ditch, 3 miles long, and delivered through 0′ of 9″ pipe to a No. 2 giant, under 80′ pressure. The bank is decom- sed bedrock and 50′ high, and the sluices are 300′ long, 20″ wide, and t on a grade of 8″ per box. D. Huey, of Happy Camp, owner.

*Humbug Flume and Mining Co.'s* (*Spengler*) *Mine* (Placer and ydraulic).—See our XIth and XIIth Reports, pp. 441 and 292. This a bar claim, situated at the mouth of Humbug Creek, 12 miles N.W. m Yreka, at 2,150′ elevation, and comprises two claims; one of 38 res and one of 15 acres. The gravel bank, from 27′ to 30′ deep, is mewhat cemented, resting on a slate bedrock, next to which are many avy bowlders. The gold is scattered throughout the wash, though stly to be found in the 5′ or 6′ next the bottom. Some powder is ed to loosen the gravel. A steam derrick, with 60′ mast and 74′ boom, run by a 15 H.P. engine. The gravel is washed through 40 boxes, ″x 18″, and set on grades averaging 9″ to the box; these boxes are eaned up once a week when working top gravel, and twice a week nen cleaning bedrock, which is picked up from 2″ to 1′. Eleven men e employed, working one shift. Spengler Bros. et al, of Yreka, owners.

*Hungry Hill* (*Gold Run*) *Mine* (Quartz).—See our XIth Report, pp. 9–430. It lies on Knownothing Creek, 8 miles S. of Forks of Salmon, 3,350′ elevation. Since last described, three tunnels have been driven, 0′, 120′, and 300′, respectively, below the old workings. No. 5 is 100′, No. is 480′, and No. 7 is 600′ long. In No. 7, the lowest, both the Hunter in and the Gold Run vein have been cut. They lie about 200′ apart, n nearly parallel, and dip about 60° S.W. The pay-shoot on the old Run is 260′ long and dips W. The ore is a hard white quartz, th 3% of iron, zinc, and lead sulphurets. The old 4-stamp mill is rn out, and a new 10-stamp mill and three Frue vanners are on the ound ready to be put up. Water through a 7″ pipe, acting upon a 3′ lton wheel under 850′ pressure, will furnish the power. The wheel ll drive also an air-compressor for five power drills. A. Dannenbrink, Gilta, owner.

*Hunter & Downey Mine* (Quartz).—See our XIIth Report, p. 285. is on White's Gulch, 5 miles S. of Sawyer's Bar. Idle. H. Hunter d L. Downey, of Sawyer's Bar, owners.

*Huntington Mine* (Placer).—This is on Grouse Creek, 5½ miles E. of llahan, at 3,980′ elevation. It is worked by ground-sluicing. J. untington, of Callahan, owner.

*Indian Bar* (*Ayles & Dunn*) *Mine* (Placer).—See our XIIth Report, 277. It lies on South Fork River, 6 miles above Forks of Salmon, at 390′ elevation. The claim is worked by ground-sluicing, water being tained from Indian Creek. Ayles & Dunn, of Gilta, owners.

*Indian Creek* empties into Scott River some 3 miles below Fort Jone The bottom of the valley is filled with auriferous gravel, which is min by the drifting process at the lower end of the creek, and by open place and hydraulicking above. In the surrounding hills at and above t village of Hooperville, many small quartz lodes are found, and son have been worked with varying success. The country rock is gr porphyry.

*Ingham Mine* (Hydraulic).—This is on Klamath River, 19 mil below Cottage Grove. It is a new location, and is being put in shape be ready for piping during the season of 1895–96. Walter Ingham, Cottage Grove, owner.

*Insurance Mine* (Quartz).—It lies at the head of Barkhouse Creek, miles N.E. of Scott Bar, at 3,260′ elevation. The vein is 2′ thick ar dips 50° W. It is prospected by a tunnel 53′ long. C. E. Humphrey of Scott Bar, owner.

*Ironsides Mine* (Quartz).—See our XIIth Report, p. 285. It is on t divide between Greenhorn Gulch and Cherry Creek, 8 miles S.W. fro Yreka, at 4,650′ elevation. The vein is 1′ to 2′ wide, trends N. and and dips 48° E., between serpentine and hornblende-schist. The ou crop has been exploited through short tunnels and open cuts over distance of 1,300′, showing the presence of gold throughout. The ro is crushed in a hand-mortar. J. Ironsides, of Yreka, owner.

*Itney Mine* (Hydraulic).—It lies on Beaver Creek, 15 miles N.E. Oak Bar. The plant consists of 1,000′ of 8″ pipe, a No. 2 giant, ar 600′ of 24″ sluices. The ditch is 2½′ wide by 2′ deep, and 2 miles lon it takes water from Beaver Creek. J. T. Itney, of Oak Bar, owner.

*Jackson Mine* (Placer).—See our XIIth Report, p. 285. It is on Litt Humbug Creek, 4 miles E. of Walker, at 2,295′ elevation. The clai contains 20 acres, and is worked by ground-sluicing. B. B. Jackson, Walker, owner.

*Jacobs & McCarthy Mine* (Hydraulic).—This lies on Scott River, mile S. of Scott River, at 2,150′ elevation. Water is obtained fro Randall Lake by a short ditch; 300′ of 11″ pipe give 100′ pressure to No. 1 giant. The gravel bank is 20′ high. The claim lies on t second bench, and contains 40 acres. D. McCarthy et al., of Scott Ba owners.

*Jehovah Mine* (Quartz).—It is 2 miles N.W. from Yreka, at 3,00 elevation. The E. and W. vein dips 70° N., between gneiss and po phyry, and is 2′ to 3′ wide; the quartz is of ribbon structure, a carries 1% sulphurets. The developments consist of a 5′x7′ shaft, 4 deep on the vein, with a 30′ drift to the W.; 150′ below an adit level started, and 97′ have been completed. One man is at work. O. Lawson, of Yreka, owner.

*Joe Francis & Co.'s Mine* (Placer).—It is in Hawkinsville, at 2,35 elevation, and contains 20 acres, with a quarter interest in the Gree horn ditch. The gravel bank, 10′ to 12′ high, is worked by groun sluicing. The water season is four months on an average. Joe Fran et al., of Hawkinsville, owners.

*Johnson Mine* (Quartz).—See our XIIth Report, p. 285. It is Quartz Valley, S. of Hull Gulch, at 3,480′ elevation. The workings a said to extend 600′ below the surface. The mine lies idle, and the wor ings are caved. Estate of Richard Johnson, owner; J. Moxley, of Etn agent.

*Johnson Mine* (River).—See our XIIth Report, p. 285. This is in ıe bed of Horse Creek, 16 miles N.W. of Oak Bar, at 2,300′ elevation. edrock lies 10′ below water-level. A derrick and a pump-wheel are ;iven by water-power. W. T. Johnson, of Oak Bar, owner.

*Johnny Bull Mine* (Drift and Placer).—It lies on McAdams Creek, 5¼ iles N. of Fort Jones. Part of this claim has been drifted, but at :esent the bedrock is being stripped. A large derrick, with 1″ manilla )pe and a 90′ boom, is used to hoist the gravel, which is 20′ to 25′ deep, the surface. The whole of the material carries gold and is run ırough the sluices. A steam-engine with 6″x 12″ cylinder furnishes ıe power. The gravel is handled in flat boxes 3′x 4′x 1′, open on one de, and arranged to dump by pulling a short rope. Hop Sing Co., Fort Jones, owner.

*John Jones Mine* (Placer).—It is situated on the North Fork of umbug Creek, and is worked by 6 Chinese.

*John Miller Mine* (Placer).—It is 1 mile N. from Hawkinsville, at 650′ elevation, and contains 40 acres of patented ground, with a one uarter interest in the Greenhorn ditch. The mine is worked by ground-uicing, during the four months' water season, and the 10′ to 14′ bank drifted the remainder of the season. The gold is coarse, and found ext the bedrock. The flume is 900′ long, and set on a 4″ grade. Four ıen are employed. J. A. Tiexeria, of Yreka, owner.

*Jordan Mine* (Auriferous Trap).—It is 1 mile E. of Summerville, at 250′ elevation. The vein matter is a trap rock with pyrite, standing early vertically between walls of eruptive granite. A 100′ tunnel has een driven on the vein. Cyrus Jordan, of Cecilville, owner.

*Jumbo Mine* (Quartz).—See our XIIth Report, p. 285. It lies on White's Gulch, 4½ miles S.E. of Sawyer's Bar, at 3,340′ elevation. The evelopments consist of three tunnels, 60′, 120′, and 200′ long, all on the ein. The ore is a white quartz, with some sulphurets. In the middle ınnel the vein is 4′ thick, and arrangements have been made to stope. he ore is to be run to the mill through a chute 4′ wide. The mill ands near the creek, has 10 stamps of 750 lbs., No. 9 screens, 12′ of malgamated plates, and is driven by a 30″ Pelton wheel under 200′ ressure. Dr. H. C. Helm et al., of Sawyer's Bar, owners.

*Junction Bar Mine* (River).—This is at the mouth of Scott River, 2 ıiles below Scott Bar, at 1,645′ elevation. A crib-dam in the river 200′ )ng, and a ditch 3′ wide by 2′ deep and ¾ mile long, furnish water for ıe sluices and for a large overshot hoisting-wheel. The sluices are 24″ ide, 600′ long, and dump the debris into the Klamath. The claim lies n a bar in Scott River, and bedrock is 10′ below water-level. No pumps re required; 8 shovelers keep a large derrick going. Fang Yick Co., of cott Bar, owner.

*Kanaka Mine* (Placer).—It is situated at Gottville, at 1,950′ eleva-on, and embraces 60 acres; the gravel is about 14′ deep. Idle.

*Kaper Mine* (Placer).—It is on Eddy Gulch, 1¾ miles S. of Sawyer's ar, at 2,740′ elevation. The claim contains 10 acres, and is worked by round-sluicing. J. P. Kaper, of Sawyer's Bar, owner.

*Katie May Mine* (Quartz).—It lies on Greenhorn Gulch, 6 miles W. f Yreka, at 2,500′ elevation. The vein is 7″ to 19″ wide, trends N. and ., and dips 85° W., between slate and porphyry walls; the slate carries nough lime to cause it to swell. The quartz carries 5% of sulphurets. 'he ore is hauled 16 miles and crushed in a custom mill. The develop-

ments consist of a 60′ shaft and 120′ tunnel, on the vein. Four me are employed. M. Carrick, of Yreka, owner.

*Kee Hong* (*G. Knichts*) *Mine* (River).—It is situated at the mouth Humbug Creek, at about 1,900′ elevation, and contains 40 acres. dip and a pump wheel are used; also a derrick, with 65′ swee run by water-power. The cut is 60′ deep, 70′ wide, and 200′ long; tl gravel requires blasting, but carries few bowlders. Twenty Chinese a employed. A Chinese company, owner.

*Keffer Mine* (Drift).—It is on Klamath River, 1½ miles below Oa Bar, at 1,890′ elevation. The claim contains 40 acres, and is worked b drifting in the bank of the river. J. C. Keffer, of Oak Bar, owner.

*Kellner, Doescher & Mahr* (*Buckhorn, U. S.*) *Mine* (River and Drift).- This is on North Fork River, 2½ miles W. of Sawyer's Bar, at 2,14 elevation, and contains 40 acres, lying partly in the river-bed and parti on the second bench. The river is turned by a timber dam into a artificial channel ¼ mile long, and the original bed is left dry. Bedroc is 15′ below water-level; two large Chinese pumps and a derrick a driven by overshot wheels, power being obtained through a ditch, 3′ wic and 1 mile long, from the river. The sluices are 14″x 14″, and 500′ lon and are fitted with pole riffles. During high water drifting is carried o in a bank of gravel (second bench), 50′ above the river. G. A. Mahr al., of Sawyer's Bar, owners.

*Kettlewood & Tibbets Mine* (Placer).—See our XIIth Report, p. 28 Abandoned.

*Kiernan Mine* (Quartz).—It is 9 miles S.W. of Edgewood, at 6,00 elevation. The vein trends N.W., and dips 70° S.W., between grani walls, to which it is frozen. A tunnel to strike the ledge at 70′ dep has cross-cut 170′, and has 35′ to run yet to reach the point. A sha has been started on the vein. P. Kiernan, of Gazelle, owner.

*King Solomon Mine* (Quartz).—It is a prospect, on the divide betwee the Middle Fork of Humbug and Sucker creeks, about 12 miles N.W from Yreka, at 4,000′ elevation. Idle. Dr. Sounger, of Ashland, Orego owner.

*Klamath Mine* (Quartz).—See our XIth Report, page 432. It lies the head of Eddy Gulch, 4 miles S. of Sawyer's Bar, at 4,800′ elevatio and comprises three full claims. The quite extensive old workings ha lain idle several years, although a large body of low-grade ore is blocke out. The vein is 5′ thick. A tunnel, 65′ long, was driven during 189 Idle. Golden Ball Mining Co., owner; A. Ball, of Sawyer's Bar, supe intendent.

*The Klamath River*, below the mouth of Scott River, has cut its wa through the northern end of the Coast Range and nearly at right angl to its trend. It runs through a rather narrow cañon from a few hu dred to several thousand feet in depth, with slopes as steep as t material, whether rock or earth, will stand, and which are clothed wit a dense growth of timber and brush. At Hamburg Bar, Happy Cam Orleans Bar, and a few other places, the mountains recede far enoug from the stream to admit of a few acres of level land being farme the rest of the country is too steep for cultivation. Gold is found wher ever the river has deposited gravel, whether it be in an old chann 1,000′ above the present river or in the bottom of the stream, deposite yesterday. Water for mining is obtained during the rainy season fro the small tributaries, which hold their volume for from six to eig

nths in the year. In the summer most of the mines shut down for nt of water. Supplies are brought into the country by wagon as far Happy Camp, and from Arcata, in Humboldt County, or Waldo, egon, by pack mule. The formation throughout the region is blue- ck slate of enormous thickness, lying with a general westerly dip. It undoubtedly metamorphic Cretaceous shale.

*Klein's Mine* (Hydraulic and Drift).—See our XIIth Report, p. 286. lies on North Fork River, below Sawyer's Bar. About ½ acre of bed- k was cleaned during 1895. W. E. Klein, of Sawyer's Bar, owner.

*Klepper Mine* (Placer).—This is on Little Humbug Creek, 4¾ miles of Walker, at 2,460′ elevation. The claim contains 20 acres, and is rked by ground-sluicing. Wm. Klepper, of Walker, owner.

*Knownothing Mine* (Quartz).—See our XIIth Report, p. 286. It lies Knownothing Creek, 8 miles S.E. of Forks of Salmon, at 3,075′ vation. The developments consist of three tunnels, 400′, 1,300′, and 0′ long. The vein, 18″ thick, was lost several years ago, and the ddle long tunnel is being run with a view of finding it again. A stamp mill, driven by a hurdy wheel under 120′ pressure, belongs to e property. W. P. Bennett, of Forks of Salmon, owner.

*Lane Mine* (Hydraulic).—See our XIIth Report, p. 286. It is on lamath River, 3 miles below Hamburg Bar, at 1,720′ elevation. Water taken from O'Neal Creek by a ditch 3′ wide by 2′ deep and 1½ miles ng; it is delivered through 800′ of 11″ pipe to a No. 2 giant, under 0′ pressure. There are 800′ of 24″ sluices, with a grade of 8″ per box, d an 80′ bank with 15′ of gravel. D. Lane, of Hamburg, owner.

*Lange Mine* (Hydraulic).—See our XIIth Report, p. 286. This lies Barkhouse Creek, 4 miles E. of Walker, at 2,250′ elevation, and nbraces 160 acres. The bank is 10′ to 80′ high, and the gravel 6′ to 40′ ep. The equipment consists of 1,000′ of 7″ pipe, a No. 2 giant, work- g under 250′ pressure, and nearly a mile of 24″ sluices. There are two tches from Barkhouse Creek; one, furnishing water for the giant, is 3′ de by 2½′ deep and 5 miles long; the other is 2 miles long and 4′ wide 3′ deep, and used for the sluices. Large lanterns furnish light at ght. Lange Bros., of Oak Bar, owners.

*Lango Mine* (Quartz).—See David Ledge.

*Last Chance Mine* (Quartz).—See our XIIth Report, p. 286. It is ¼ ile W. of Oro Fino, and is developed by three tunnels, 300′, 200′, and 0′ long, all on the vein. The ledge averages 2′ in width, and dips 35° E. Richard Lindsey, of Oro Fino, owner.

*Last Chance Mine* (Drift).—See our XIIth Report, p. 286. It lies ¼ ile N. of Callahan, at 3,320′ elevation, and has been idle several years. . A. Denny et al., of Callahan, owners.

*Last Chance* (*Grattan*) *Mine* (Quartz).—See our XIIth Report, p. 283. lies on South Fork River, 6 miles above Forks of Salmon. There is tunnel 40′ long and some open cuts. The ore is treated in an arras- a. Wagner & Campbell, of Sawyer's Bar, owners.

*Last Chance* (*Stewart*) *Mine* (Quartz).—This is on Indian Creek, 7½ iles N. of Fort Jones, at 3,225′ elevation. The development consists a 300′ tunnel. Idle since 1892. George Tonkin, of Fort Jones, owner.

*Last Venture Mine* (Hydraulic).—It is on Klamath River, 9 miles elow Happy Camp, and contains 70 acres, at 1,520′ elevation. Water obtained from Wingate Creek, through a ditch 2½′ wide by 1½′ deep nd ¾ mile long, on a grade of 12.8′ per mile; and delivered through

400′ of 11″ pipe to a No. 2 giant, under 70′ pressure. The sluices a 20″ wide and have an 8″ grade; the bank is 80′ high, with 60′ of gra M. Doolittle, of Happy Camp, owner.

*Lee Mine* (Placer).—It lies on the second bench on Klamath River miles above Happy Camp, at 1,520′ elevation. Water for ground-slu ing is taken from Joe Miles Creek. Lee & Co., of Happy Camp, owne

*Lee Han* (*Bear Bar*) *Mine* (Drift and River).—It is on the Klama River at Gottville, at 1,975′ elevation, and contains 16.7 acres. It worked by the help of wing-dams, and requires the use of six river whe for pumping, dipping, and hoisting. The two pits are 90′ long, and t gravel, of a loose character, is 30′ deep, and carries both fine and coa gold. The two derricks used have 70′ sweep. The 16″x 15″ flume c sists of 200 boxes, set on a grade of 8″ to the box, and paved with bloc The boxes are cleaned up every week. Fifty Chinese are employ Lee Han & Co., of Gottville, owners.

*Lee Yet Bar Mine* (Hydraulic).—This is on the Klamath Riv 8 miles below Hamburg Bar, at 1,675′ elevation, and contains 380 ac The bank is 30′ high, and the gravel 12′. Water is derived from Sei Creek, through 4 miles of ditch, 4′ wide and 2½′ deep, and delive through 2,000′ of 24″ and 11″ pipe to three No. 2 giants, under pressure. Lee Yet Co. (Chinese coöperative), of Seiad, owner.

*Leonard Mine* (Placer).—See our XIIth Report, p. 286. Abandon

*Lewis Mine* (Quartz).—It lies on Dead Bull Gulch, ¾ mile N. of C Fino. The vein shows about 5′ of quartz; but little work has been d on it. Grant Lewis et al., of Oro Fino, owners.

*Liberty Mine* (Quartz).—See our XIIth Report, p. 286. It is at t head of Eddy Gulch, 4 miles S. of Sawyer's Bar, and adjoins the Gold Ball, at 3,400′ elevation. There are three tunnels on the claim, 25′, 5 and 80′ long. The ledge is from 3′ to 8′ wide, and dips 20° E. Steve Grant & Hughes, of Sawyer's Bar, owners.

*Lima Mine* (Quartz).—This prospect is on the South Fork of Humb Creek, about 4 miles W. from Yreka, at 2,400′ elevation. The E. a W. vein is 16″ to 3′ wide, and dips 60° S., between slate and porphy walls. The quartz is of a gray, ribbon structure, and carries ½% sulphu ets. The developments consist of a 45′ cross-cut tunnel to the vein and of drift thereon. H. Lawson, of Yreka, owner.

*Lime Gulch Mine* (River).—It is on the Klamath River, just bel the mouth of Lime Gulch, at 2,100′ elevation, and contains 20 acr The river has been wing-dammed, and one dip-wheel and one pum wheel are used; also a water-power derrick. The gravel is wash through 150′ of sluices. Twelve Chinese are employed. A Chin company, owner.

*Lime Point Mine* (Drift).—It is 14 miles N.W. from Yreka, and c tains 20 acres. Idle. H. Bucher, of Yreka, owner.

*Littlefield Mine* (Hydraulic).—This is on Scott River, 1½ miles bel Callahan, at 3,210′ elevation, and contains 160 acres; it derives it wa from Sugar Creek. A No. 1 giant, under 125′ pressure, is supplied 1,100′ of 11″ to 15″ pipe. The sluices are 30″ wide, and are set on grade of 6″ per box. The claim lies on the second bench, and contai no bowlders. W. Littlefield, of Callahan, owner.

*Little Humbug Mine* (Placer).—It lies on the Klamath River, 2 mi above Walker. B. B. Jackson, of Walker, owner.

*Little Queen* (*Erno*) *Mine* (Quartz).—See our XIIth Report, p. 281. is at the mouth of Evans Gulch, in Quartz Valley. There is a haft 75′ deep, and a tunnel 150′ long on a vein of 6″ to 18″ white quartz, which dips 15° E. The ore is treated in an arrastra, at the rate of 1½ tons per day. A 12′ hurdy wheel, using 25 inches of water, under 80′ pressure, furnishes the power. Elrim Erno, of Fort Jones, owner.

*Little Wanderer Mine* (Quartz).—It is situated on Cherry Creek, 10 miles S.W. of Yreka, at 4,775′ elevation. The vein is 4″ to 5″ wide, and rich; trends a little E. of N., and dips E.; 100′ of the 200′ tunnel has been stoped and two 45′ winzes sunk. There are about 100′ in stacks. One man is at work. J. Ironsides, of Yreka, owner.

*Long Gulch Mining Co.'s* (*Tim Cardoza*) *Mine* (Placer).—It is in Long Gulch, at 2,500′ elevation, and contains 140 acres. The gravel bank, from 10′ to 12′ deep, is worked by ground-sluicing, taking water from Long Gulch; the season lasts three months; 450′ of flume is used. Five men are employed. Tim Cardoza, of Yreka, owner.

*Lowden Mine* (Hydraulic).—See our XIIth Report, p. 286. This is on Klamath River, 3 miles below Hamburg Bar, at 1,670′ elevation, and contains 80 acres. Water is taken from Coon Creek by a ditch 3′ wide by 2′ deep and 1½ miles long, and delivered through 1,000′ of 11″ pipe to a No. 2 giant, under 200′ pressure. The sluices are 600′ long, 24″ wide, and paved with block riffles. No derrick is used, the bowlders being blasted. J. S. Lowden, of Hamburg, owner.

*Low Hill Mine* (Auriferous Trap).—This is 1 mile E. of Summerville, at 3,375′ elevation. There is a tunnel 350′ long on a 4′ vein of trap, containing auriferous pyrite. The walls are eruptive granite. A 4-stamp mill, driven by a hurdy wheel under 100′ pressure, belongs to the property. The stamps weigh 650 lbs.; No. 8 slot screens and 10′ of silvered plates are used. Dr. J. H. Ring et al., of Ferndale, Humboldt County, owners.

*Lucky Bar Mine* (Hydraulic).—This is 1 mile below Callahan, on Scott River, at 3,240′ elevation. Idle. J. D. Heard, of Callahan, owner.

*Lucky Bob Mine* (Hydraulic).—See our XIIth Report, p. 287. It is situated at Honolulu (Gottville), at 2,000′ elevation, and consists of 40 acres of bench gravel; the bank is 20′ deep. Water (200 inches) is taken from Lum Gray Creek through ¾ mile of ditch, and passed through a 6″ pipe with a 2″ nozzle, under 65′ pressure. The season lasts four months. The gravel requires some powder to loosen it up. Three quarters of an acre was removed the past season by two men. There are 500′ of sluices, set on a 2″ grade, and paved with blocks. Freshour Bros., of Gottville, owners.

*Lucky John Mine* (Quartz).—It is on the North Fork of Humbug Creek, at 3,000′ elevation. The vein, of rich rock, is 6″ wide, courses N.E. and S.W., and dips 75° S.E. in granitic rock. An open cut has been started. Two men are working. T. E. Williams and John Martin, of Yreka, owners.

*Luke Shaw Mine* (Drift).—It is on Indian Creek, 4½ miles N. of Fort Jones, and contains 20 acres. Bedrock lies 45′ below the surface. The claim is worked by drifting, and hoisting the material by a horse-whim through a 4′x4′ shaft to the surface. Luke Shaw (Chinese), of Fort Jones, owner.

*Mabel Mine* (Quartz).—See our XIIth Report, p. 287. This lies on t north side of Baldy Ridge, 7 miles N.E. of Scott Bar, at 4,875′ elevatio There are four tunnels on the claim, from 30′ to 180′ long. The ve is from 1′ to 3′ wide, and dips 30° N.W. between porphyry walls. W. Chamberlain et al., of Yreka, owners.

*Magnitude Mine* (Quartz).—It is on the South Fork of Humbug Cree 5 miles W. from Yreka, at 2,900′ elevation. The 1′ to 4′ wide ve trends N.E. and S.W. and dips vertically between slate and porphyr The quartz carries 2% of sulphurets and arseniurets. A prospect tunn has been driven 157′ on the vein. Only assessment work is done. O. Lawson, of Yreka, owner.

*Maloney Mine* (Hydraulic).—See our XIIth Report, p. 287. It is North Fork River, 2 miles below Sawyer's Bar, at 2,165′ elevatio Water is taken from Jackson Creek by a ditch ½ mile long, and deliver through 200′ of 10″ pipe to a No. 1 giant, under 60′ pressure. Bedro lies 20′ above the river, and the bank is 30′ high with 3′ of pay-grav William Maloney, of Sawyer's Bar, owner.

*Maplesden Mine* (Hydraulic).—See our XIIth Report, p. 287. Th lies on Klamath River, 3 miles below Hamburg Bar, at 1,730′ elevatio and contains 40 acres. The bank is 100′ high, with 30′ of gravel, a the sluices are 24″ wide and 300′ long. There are a No. 1 giant a 700′ of 11″ pipe on the ground; the 2′ ditch is 1½ miles long, and tak water from Nigger Creek. Maplesden Bros., of Hamburg, owners.

*Maplesden & Son's Mine* (Drift).—See our XIIth Report, p. 287. is on Klamath River, at Hamburg Bar, at 1,750′ elevation. The ma drift runs under the village, is 500′ long, and lies 34′ below water-lev The gravel cars are pulled up a 230′ incline by a water-wheel. T pumping is done by two Chinese pumps, each raising the water 1 The upper one is driven by the water-wheel direct, and the lower o by wire-rope transmission. The power is furnished by a 14′ hur wheel, working under 110′ pressure. Water is obtained from two sm creeks through 2 miles of 2′ ditch and 500′ of 9″ pipe. Maplesden Son, of Hamburg, owners.

*McAdams Creek* is a small stream, some 15 miles long, the upper e being called Spring Creek. It empties into Scott River, 1 mile W. Fort Jones. The valley through which it runs consists of gold-bear gravel, here and there overlaid with sufficient soil to farm. At Fo Jones it is nearly a mile wide, gradually becoming narrower towa its source. From a point 4 miles N. of Fort Jones to its head, t creek-bed was or is still being mined, partly by drift process, whe bedrock lies deep below the surface, and partly by ordinary plac operations, where the gravel is shallow.

*McCann Mine* (Placer).—It is situated at the Forks of Humb Creek, 7 miles N.W. from Yreka, at 2,700′ altitude, and comprises 6 along a bar in the channel of Humbug Creek. The gravel bank is 1 deep, and is worked by ground-sluicing through 10 sluice-boxes, set an 8″ grade. One hundred inches of water is taken from the Nor Fork of Humbug Creek through 450′ of ditch, under 20′ pressure. O man is at work. James Man, of Yreka, owner.

*McCauley Mine* (Drift).—See our XIIth Report, p. 287. It lies Scott River, 1 mile N. of Scott Bar, at 1,820′ elevation. It is worked drifting in the bank of the river. James McCauley, of Scott Ba owner.

*McCrey & Maplesden Mine* (Hydraulic).—See our XIIth Report, p. '. It is on the second bench on Klamath River, ½ mile above Ham-g Bar, at 1,860′ elevation. Water is obtained from Tom Martin ek by a ditch 1 mile in length, and delivered through 300′ of 11″ e to a No. 2 giant, under 200′ pressure. The sluices are 30″ wide l 300′ long, with Hungarian and block riffles. B. F. Maplesden et al., Hamburg Bar, owners.

*McGuffy Mine* (Hydraulic).—See our XIIth Report, p. 287. It lies Scott Bar, on the second bench, at 2,120′ elevation. There are 100′ 30″ sluices and a No. 2 giant, under 100′ pressure. Water is obtained m the Quartz Hill ditch through 300′ of 11″ pipe. The bank is 60′ h, with 10′ of gravel. G. McGuffy et al., of Scott Bar, owners.

*McMahon Mine* (Drift).—See our XIIth Report, p. 287. It is on the ıth Fork of Scott River, 3 miles above Callahan. The claim contains acres, and is worked by drifting. J. W. McMahon, of Callahan, ner.

*McNeal Mine* (Hydraulic).—See our XIIth Report, p. 287. This is Salmon River, 4½ miles below Forks of Salmon, at 1,020′ eleva-n, and contains 60 acres. The bank is 18′ high, and all gravel. ater is taken from Nordheimer Creek by a ditch 4 miles long and 5′ le by 2′ deep, and delivered through 1,000′ of 11″ to 18″ pipe to a No. 3 nt, under 100′ pressure. George McNeal, of Forks of Salmon, owner.

*McNeal Bar Mine* (Hydraulic).—See Forks.

*Metropolitan Mine* (Quartz).—See our XIIth Report, p. 287. It lies White's Gulch, 4½ miles S.E. of Sawyer's Bar. A tunnel 75′ long closes a 5′ vein, dipping 15° E. Parker & Son, of Etna, owners.

*Meyers Mine* (River).—It is on a bar in the Klamath River, ½ mile low Hamburg Bar, at 1,745′ elevation. Idle. William F. Meyers, Hamburg, owner.

*Milich Mine* (Hydraulic).—See our XIIth Report, p. 288. This lies Salmon River, 4½ miles below Forks of Salmon, at 1,090′ elevation, d contains 20 acres. Water is obtained from Crapo Creek through a ch 1½ miles long and delivered through 700′ of 11″ pipe to a No. 1 ınt, under 200′ pressure. The bank is 30′ high, and shows 15′ of ıvel. P. Milich, of Forks of Salmon, owner.

*Miller Mine* (Placer).—This lies on the South Fork of Salmon River, miles above Summerville, and contains 40 acres. The bank is 40′ gh, with 8′ of gravel; the sluices are 18″ x 18″ and 200′ long, set on a grade. The ditch takes water from the river and is 1 mile long. J. Miller, of Cecilville, owner.

*Miller Mine* (Drift).—This is on South Fork of Scott River, 5 miles ove Callahan, at 4,500′ elevation. The claim is worked by drifting ıder the river. W. J. Miller, of Callahan, owner.

*Miller Mine* (Quartz).—This is ⅜ mile N.W. of Oro Fino. The vein 8″ thick, lies in porphyry, and dips 40° S.E. The developments nsist of three tunnels, 100′ to 120′ long. Idle. William Ray et al., of o Fino, owners.

*Milne Mine* (Hydraulic).—It is situated at Scott Bar, at 2,050′ eleva-ɔn. Water is taken from the Quartz Hill ditch through 800′ of 11″ pe. The sluices are 24″ wide and 150′ long. The many large bowlders curring in the mine are removed by a large derrick driven by an over-ıot water-wheel. A No. 1 giant, under 75′ pressure, is used. The bank

is 60′ high, with 20′ of gravel on serpentine bedrock. A. Milne, of Sc Bar, owner.

*Mint Mine* (Quartz).—It is 1½ miles W. from Yreka, at 3,000′ ele tion. The N. and S. vein is 2″ to 8″ wide, and pitches 45° E. in gre stone. A 3′x 6′ shaft has been sunk 40′ deep on the dip of the vein, a a 30′ drift run. Below the shaft a tunnel has been started on the ve Two men are employed. E. Herr and — Vannader, of Yreka, owne

*Missouri Bar Mine* (Placer).—See our XIIth Report, p. 288. T lies on the South Fork of Salmon River, 2 miles above Forks of Salm at 1,700′ elevation. Idle. W. P. Bennett, of Forks of Salmon, owner

*Montez Mine* (Hydraulic).—See our XIIth Report, p. 288. It is Salmon River, 5 miles above Somes Bar. Abandoned.

*Montezuma Mine* (River).—See our XIIth Report, p. 288. This is Callahan, at 3,500′ elevation, and comprises 60 acres lying along the b of South Fork River. Bedrock lies from 20′ to 30′ below water-lev All the gravel from the full width of the valley is run through t sluices. The bowlders are removed by a large derrick, using a 2″ mani rope for hoisting, and driven by a 30″x 14′ overshot water-wheel. T sluices are 4′x 4′ and 3,000′ long. Hop Yick Co. (Chinese coöperativ of Callahan, owner.

*Montezuma Hill Mine* (Hydraulic).—See Siskiyou Mining Co.

*Moore Mine* (Placer).—This lies 3½ miles above Sawyer's Bar, North Fork River, at 2,680′ elevation. A dam in the river, 9′ high, fi a ditch 3′ wide by 2′ deep and 1½ miles long. The sluices are 24″x 1 and set on a grade of 5″ per box. Worked by ground-sluicing. Thom Moore, of Sawyer's Bar, owner.

*Morgan Point Mine* (River).—It lies on Klamath River, 6 miles abo Happy Camp, at 1,420′ elevation, and contains 40 acres. Bedrock li 7′ below water-level. Water is obtained from the river in a ditch 2′ wi by 2′ deep and 1 mile long; three current-wheels furnish the pow Idle. M. Doolittle, of Happy Camp, owner.

*Morning Star Mine* (Quartz).—This is at the head of Barkhou Creek, 13 miles S.E. of Scott Bar, at 3,270′ elevation. There is a tunn 30′ long on a vein of quartz 2½′ thick. The dip is nearly vertical, a the strike N.W. James Wright, of Walker, owner.

*Mott Mine* (Drift).—It lies on Klamath River, ½ mile above Oak Ba at 1,920′ elevation, and is worked by drifting in the bank of the riv C. Mott, of Oak Bar, owner.

*Mountain Boy Mine* (Quartz).—See Schroeder.

*Mountain Belle Mine* (Quartz).—See Cartwright & Phillips.

*Mountain Sprout Mine* (Hydraulic).—It is on Klamath River, miles below Happy Camp, at 1,500′ elevation, and contains 140 acre A ditch 2½ miles long, taking water from Wingate Creek, is under co struction. It is to have a grade of 14′ per mile, and to measure 2½′ wi by 1½′ deep. M. Doolittle, of Happy Camp, owner.

*Mount Bolivar Mine* (Quartz).—This lies on Fox Creek, 5 miles S.W of Callahan, at 4,620′ elevation. There is a tunnel 40′ long on th claim. George W. Smith, of Callahan, owner.

*Muck-a-Muck Mine* (Hydraulic).—See our XIIth Report, p. 288. is on Klamath River, 4½ miles above Happy Camp, and contains 2 acres, lying at 1,430′ elevation. Water is taken from Ambrose Cree through a ditch 2½′ wide by 2′ deep and 4 miles long, and delivere through 2,000′ of 11″ pipe to a No. 2 giant, under 150′ pressure. Th

k is 25′ high and about half gravel. The sluices are 20″ wide and e an 8″ grade. Mrs. W. B. Reeve, of Happy Camp, owner.

*Musgrave Mine* (Placer).—This is on Little Humbug Creek, 5¼ miles of Walker, at 2,600′ elevation. The claim contains 20 acres, and is rked by ground-sluicing. Mark Musgrave, of Walker, owner.

*Myer & Smith Mine* (Drift).—See our XIIth Report, p. 288. It lies Scott River, just below Sawyer's Bar, at 2,350′ elevation. The im is worked by drifting in the first bench. Myer & Smith, of vyer's Bar, owners.

*Nebraska Mine* (Quartz).—It is on Cherry Creek, 10 miles S.W. from ka, at 4,300′ elevation. The N. and S. vein is about 1′ wide, and s 55° E. in a hornblendic formation. The quartz is of ribbon struct-, with plenty of black oxide of manganese and but few sulphurets. 'x 6′ shaft has been sunk 65′ on the vein, and 180′ of tunnel run on course of the vein. The ore is crushed in a custom arrastra, at a t of $2 per ton. Two men are employed. H. Mack, of Yreka, owner.

*Nelson (Del Monte) Mine* (Quartz).—It is on Eliza Gulch, 12 miles W. of Yreka, at 4,260′ elevation. The E. and W. vein is 4′ wide, and s 40° S. in serpentine rock. It has been opened by tunnel and shaft; former is 350′ long, and the 4′x 7′ shaft is 50′ deep; no timbering uired. One man is at work. Haggin & Hearst et al., of San Fran-co, owners.

*Nesbit & Hunt Mine* (Drift).—It is situated at Scott Bar, at 2,050′ vation. The claim contains 20 acres and is worked by drifting under bank of the river, water for sluicing being obtained from the Quartz ll ditch. Nesbit & Hunt, of Scott Bar, owner.

*New York Mine* (Quartz).—See our XIIth Report, p. 289. This lies Indian Creek, 9 miles N. of Fort Jones, at 3,300′ elevation. Idle. W. Miller, of Fort Jones, owner.

*Nicolett Mine* (Drift).—It lies at the mouth of White's Gulch, 3½ miles ove Sawyer's Bar, at 2,660′ elevation, and is worked by drifting in first bench. Water for sluicing is obtained, through ½ mile of flume, m White's Gulch. Charles Nicolett, of Sawyer's Bar, owner.

*Nicolett Mine* (Quartz).—See our XIIth Report, p. 289. It is on Rat-snake Gulch, near the top of Tanner's Peak, 4 miles S. of Sawyer's r. Charles Nicolett, of Sawyer's Bar, owner.

*Nigger Hill Mine* (Placer).—See our XIIth Report, p. 289. It is uated on the South Fork of Salmon River, 2½ miles above Forks of lmon, at 1,730′ elevation. Idle. W. P. Bennett, of Forks of Salmon, ner.

*Ninety* (*Hibernia*) *Mine* (Quartz).—See our XIIth Report, p. 284. is is on Eddy Gulch, 3 miles S. of Sawyer's Bar, at 3,350′ elevation. e developments consist of two tunnels, 25′ and 200′ long, respectively. e vein, dipping 40° N., shows 6″ to 36″ of white quartz, with some lphurets. J. W. Murray, of Sawyer's Bar, owner.

*Nolan Mine* (Placer).—See our XIIth Report, p. 289. It lies on South rk River, 8 miles N.W. of Callahan, at 5,900′ elevation. The claim ntains 20 acres, and is worked by ground-sluicing. Edward Nolan, Callahan, owner.

*Nolan's Bar Mine* (Hydraulic).—See our XIIth Report, p. 289. It is uated on Klamath River, 1 mile below Cottage Grove, at 1,060′ eleva-n, and contains 80 acres. Water is taken from a small gulch through ditch 1 mile long and 2′ wide by 1′ deep, and delivered through 150′

of 7″ hose to a 2″ nozzle, under 50′ pressure. The bank is 20′ and gravel 10′ high. The sluices are 20″ wide, and are set on a grade o per box. William Thomas, of Cottage Grove, owner.

*Nugget Bar Mine* (Hydraulic).—See our XIIth Report, p. 289. lies on the South Fork of Salmon River, 9 miles below Cecilville 1,950′ elevation. The bank is 30′ high and all gravel. The equipm consists of a ditch 1 mile long, 500′ of 7″ pipe, a No. 1 giant, a h derrick, and 300′ of 30″x 20″ sluices, paved with blocks. Parker & Sc of Etna, owners.

*Oak Flat Mine* (River).—It is on Klamath River, 8 miles be Happy Camp, at 1,210′ elevation, and contains 20 acres. The clain on a bar in the river, and the bedrock lies several feet below water-le The gravel is 8′ deep, and is hoisted by a derrick, driven by an overs water-wheel, 20′ in diameter and 3′ wide, to the sluices 10′ above surface of the ground. Water for power and for the sluices is obtai from Oak Flat Creek through a ditch 3′ wide by 2′ deep and 1 mile lo Coon Co. (Chinese coöperative), of Happy Camp, owner.

*Oak Grove Mine* (Drift).—See our XIIth Report, p. 289. This lies McAdams Creek, 4½ miles above Fort Jones, and comprises 25 acre bottom land. Bedrock lies from 60′ to 65′ below the surface. I Theodore Lincoln, of Fort Jones, owner.

*Ock Mine* (Hydraulic).—See our XIIth Report, p. 289. This is Klamath River, at 1,360′ elevation, and extends from Happy Camp miles down the stream. Water is obtained from Indian Creek by t ditches. One is 18 miles long, 5′ wide by 2½′ deep; the other is 3 mi long, 5′ wide by 2′ deep; both have a grade of 6′ per mile. There one No. 2 and two No. 3 giants, 3,500′ of 20″, 15″, and 11″ pipe, a more than a mile of 24″x 30″ sluices, with block riffles. The bank is high, with 10′ of gravel, and the pressure is 200′. Siskiyou Mining (Chinese coöperative), owner; Ah Ock, of Happy Camp, superintende

*O'Donnell Mine* (Placer).—It is 1½ miles N. from Hawkinsville, 1,900′ elevation, and contains 42 acres of land, leased to Chinese. T gravel bank is 20′ high, and is worked by ground-sluicing, with wa from Canal Gulch during the wet season, using 300′ of flume. Twe Chinese are at work. C. O'Donnell, of Hawkinsville, owner.

*Offiele Mine* (Drift).—It is on Klamath River, opposite Hamburg B at 1,850′ elevation, and contains 20 acres. The claim is worked drifting a well-defined old channel, 100′ above the water. The gravel run down a chute to the river, where it is washed. W. P. Offiele, Hamburg, owner.

*Ohio Mine* (Quartz).—It is 7 miles W. of Yreka, at 2,900′ elevati The N.E. and S.W. vein is 8″ wide, and dips 45° E. between gran walls. It is filled largely with ochery matter of high grade. T developments consist of a shaft 80′ deep at the mouth of an 80′ tunn both on the vein. The ground is soft and requires heavy timberi H. Lawsen, of Yreka, owner.

*Old Hundred Mine* (Placer).—It lies on Indian Creek, 2 miles N. Hooperville, at 3,420′ elevation. The claim contains 20 acres, and worked by ground-sluicing. B. M. Hammock, of Fort Jones, owner.

*Old Vet and Eclipse* (*Hossick & Brown*) *Mine* (Quartz).—It is on t Middle Fork of Humbug Creek, 9 miles N.W. of Yreka, at 3,500′ ele tion, and contains two full claims on a vein trending N.W., and dippi E. between porphyry and granite walls. Four tunnels, averaging

length, have been driven to the ledge along the slope of the hill. No ping has been done. Two men are employed. G. C. Hossick and Brown, of Yreka, owners.

*Olive Mine* (Quartz).—See our XIIth Report, p. 289. It is on Indian reek, 7 miles N. of Fort Jones. The vein is 14″ thick and dips 40° W. ne developments consist of a cross-cut tunnel 200′ long, and 200′ of ifts. Idle. W. C. Doane, of San Francisco, owner.

*Olsen Mine* (Hydraulic).—See our XIIth Report, p. 289. This lies North Fork River, 9 miles below Sawyer's Bar, at 2,000′ elevation, nd contains 60 acres. Water is conveyed from Cañon Creek through a tch 3′ wide by 2′ deep and ½ mile long, and delivered through 1,000′ of ″ to 8″ pipe to a No. 1 giant, under 250′ pressure. The sluices are ″ wide, have pole riffles, and are set on a 9″ grade. The bank is 150′ gh and all gravel, and the bedrock is decomposed granite. Bowlders e removed by a derrick driven by a hurdy wheel. Fred Olsen, of Saw-r's Bar, owner.

*Only Hope Mine* (Placer).—It is on Eliza Gulch, 14 miles N.W. from reka, at 3,650′ elevation. By the aid of small reservoirs the gravel is ound-sluiced during two months of the year; the remainder of the ar the bedrock is washed, using 15 boxes furnished with Hungarian ffles. Two men are at work. D. N. Lash, of Yreka, owner.

*Oregon Mine* (Drift).—See California Bar.

*Oregonian Mine* (Quartz).—See our XIIth Report, p. 289. It is on attlesnake Gulch, near the top of Tanner's Peak, 4 miles N. of Saw-r's Bar. The vein is 6″ thick, and dips from 16° N.W. near the sur-ce to 30° N.W. lower down. Both walls are granite. A 2-stamp mill, 50-lb. stamps, driven by a 5 H.P. engine, belongs to the property. A. . Campbell et al., of Sawyer's Bar, owners.

*Ork Mine* (Hydraulic).—This is on North Fork River, 6¼ miles below awyer's Bar. The claim contains 20 acres on the second bench. Idle. rank Hickey, of Sawyer's Bar, owner.

*Oro Grande Mine* (Quartz).—It is on the divide between Sucker Creek nd the Middle Fork of Humbug Creek, 12 miles N.W. from Yreka. he 3″ to 30″ wide vein trends a little E. of N., and dips 35° E. between orphyry and limestone. It has been exploited by two tunnels, 100′ part; one on the vein for 125′, the other cross-cutting to the vein 60′ nd then turned 100′ on the vein. Two men are at work. J. N. Coul-on and A. E. Thrash, of Yreka, owners.

*Osceola* (*Franks & Moncton*) *Mine* (Quartz).—See our XIIth Report, . 289. It lies near the head of White's Gulch, 6 miles S. of Sawyer's ar, at 3,700′ elevation. The older workings are not extended to the ein. Ore is being quarried from the croppings in open cuts. A 5-stamp ater-power mill belonging to the property stands 1,000′ below. The tamps weigh 850 lbs.; No. 9 slot screens and 12′ of silvered plates are sed. Osceola Consolidated Gold Mining Co., owner; F. D. Moncton, f San Francisco, secretary.

*Pacific River Mine* (Placer).—It is near the mouth of Humbug Creek, t 1,900′ elevation, and contains 9½ acres of ground. Idle. Mrs. Mc-onnel and George Simmons, of Yreka, owners.

*Paymaster Mine* (Quartz).—It is situated on the hill E. of Eddy ulch, 4 miles S. of Sawyer's Bar, at 4,300′ elevation. There is an ncline 50′ deep and a tunnel 60′ long, with a short winze, on the claim. he vein is 3′ thick, and the ore is a reddish quartz, with a large per-

centage of sulphurets. The dip is nearly perpendicular and the stri is N. 70° W. James Patterson and Edgar Wallace, of Sawyer's Ba owners.

*Pedebedue Mine* (River).—This is in the bed of Scott River, ½ mi below Scott Bar, at 1,680′ elevation. A current-wheel is used to run Chinese pump, and the gravel is taken to the sluices by wheelbarro Joe Pedebedue, of Scott Bar, owner.

*Peerless Mine* (Quartz).—See Schroeder.

*Penny Mine* (Hydraulic).—It lies 8 miles below Cottage Grove, on th Klamath River, at 1,010′ elevation. The bank is 60′ high, with 15′ gravel. There are 200′ of 11″ pipe and a No. 2 giant, under 100′ pre sure. The sluices are 24″ square and 300′ long, with a grade of 8″ p box. A 2′ ditch, ¾ mile long, brings the water from Dobbin Cree Henry Penny, of Cottage Grove, owner.

*Peters Mine* (Quartz).—It is situated at the head of White's Gulch, miles S. of Sawyer's Bar, at 4,725′ elevation. The vein is 8″ thic lying in slate. There are two tunnels, 60′ and 160′ long, respectively, c the ledge. Peters Bros., of Sawyer's Bar, owners.

*Pettit Mine* (Hydraulic).—See Scott River Mine.

*Phillips Mine* (Placer).—See our XIIth Report, p. 290. This lies c Seiad Creek, 5 miles N. of Seiad, at 1,940′ elevation. The ditch is mile long, and takes water from Salt Creek. There is 400′ of 6″ pip and a 1½″ nozzle under 80′ pressure, on the claim. The bank is 10′ hig and all gravel. Phillips Bros., of Seiad, owners.

*Pinkham Mine* (Quartz).—It is situated in Evans Gulch, in Quar Valley. The party holding a bond on the property is driving a 50 cross-cut tunnel to reach the vein 200′ below the old workings. Th tunnel is 400′ long, and the rock in the face is a tough trap. The vei is 18″ to 30″ thick, and is said to be one of the richest in the distric George Buckman, of Oro Fino, owner.

*Pitts Mine* (Quartz).—See our XIIth Report, p. 290. This lies ½ mi W. of Oro Fino. The vein varies from a mere seam to 12″ in thickne and is pockety. There is a tunnel 300′ long on the ledge. John Pitt of Oro Fino, owner.

*Pollard Mine* (Hydraulic).—See Scott River Mine.

*Portuguese Mine* (Placer).—This is on North Fork River, 8 miles abo Sawyer's Bar, at 2,950′ elevation. A dam in the river, 12′ high, rais the water to a 6′ ditch, ½ mile long. The claim is worked by groun sluicing. Antone Joseph, of Sawyer's Bar, owner.

*Portuguese Bar Mine* (Hydraulic).—See our XIIth Report, p. 290. lies on Klamath River, 2 miles below Seiad, at 1,650′ elevation. Th equipment consists of 3,000′ of 20″ to 11″ pipe, one No. 2 giant workin under 300′ pressure, and 800′ of 24″ sluices, set on a grade of 8″ per bo The ditch is 3′ wide by 2½′ deep, 1½ miles long, and takes water fro Portuguese Creek. James Camp, of Fort Jones, owner.

*Poverty Point Mine* (Drift).—It is on Klamath River, opposite Oa Bar, at 1,915′ elevation, and contains 40 acres. The claim is worked b drifting the second bench. H. J. Barton, of Oak Bar, owner.

*Preckel Mine* (Hydraulic).—This is on Mill Creek, near Scott Bar, a 1,920′ elevation. Water is taken from Ferry Creek by a 2′ ditch 1 mil long, and delivered through 600′ of 6″ pipe to a No. 1 giant, under 6 pressure. The bank is 20′ high, with 7′ of gravel. H. Preckel, of Sco Bar, owner.

*Providence Mine* (Quartz).—This is ½ mile W. of Oro Fino. The vein erages 12″ in width, dipping 40° S.E. between porphyry walls. The ine is developed by a tunnel 800′ long on the vein. Carson & Cradle, Oro Fino, owners.

*Punch Creek Mine* (Quartz).—It is on Punch Creek, 5 miles N.W. om Yreka, at 2,850′ elevation, and comprises two claims, 3,000′ by 600′. ie vein is 10″ to 3′ wide, trends N. and S., and dips 65° E. between anitic and porphyry walls. The developments consist of a 5′x 8′ aft, sunk 40′ on the vein; also two tunnels, 230′ and 170′ long, 90′ art; 80′ of which is still available for stoping; from the upper tunnel the surface there are 40′ of backs. The shaft is at the mouth of the wer tunnel. The quartz is of ribbon structure, well mineralized. iere is no machinery on the mine. Two men are employed. J. C. irgess and D. McCook, of Humbug, owners.

*Quartz Gulch Mine* (Placer).—It lies on Klamath River, 1½ miles ove Happy Camp, at 1,380′ elevation. Water for ground-sluicing is tained from Ambrose Creek by a ditch 2′ wide by 2′ deep and 1½ iles long. David Lane, of Happy Camp, owner.

*Quartz Hill Mine* (Hydraulic and Quartz).—See our XIIth Report, 290. It is situated at Scott River P. O., at 2,000′ elevation, and con- ins 160 acres. The bedrock consists of alternate ledges of quartz and ate, inclosed by two parallel trap dikes 1,800′ apart. The whole mass rock is crushed somewhat by the intrusion of the dikes, and on the rface it has disintegrated still more by atmospheric action. The loose aterial is being piped off, and the hydraulic rig established for that irpose is quite elaborate. There are three ditches from Mill Creek; e first is 3′ wide, 2′ deep, and 7 miles long; the second is 2′ wide, 2′ ep, and 4½ miles long, and the third is 2′ wide, 2′ deep, and 2 miles ng. There are 2,200′ of 11″ to 15″ pipe and one No. 3 and two No. giants. The longest ditch furnishes 500′ pressure, to which the crushed drock yields readily. Some gold is found throughout the quartz in in seams, which is saved in the sluices, but the greater part occurs in sts or pockets, combined with pyrite. In piping, close attention is id to the face, and whenever an iron stain or pyrite is noticed the ant is turned off, and the pocket is quarried out and milled. Upon ie of the larger ledges of quartz, called the *Spotted Dog*, a 5′x 12′ uble-compartment shaft is sunk 100′, and the quartz was found pay all the way down. Hoisting is done by a 5′ Pelton wheel. A )-stamp mill standing on the property is supplied with 750-lb. stamps, o. 7 screens, and 12′ of silvered plates. Water-power for the mill and e hoist is obtained from Scott River by a ditch 3′ wide by 2′ deep and miles long, and through 2,700′ of 15″ and 300′ of 11″ pipe. J. Gold- rg, of San Francisco, owner; C. E. Humphrey, of Scott River, super- tendent.

*Quartz Valley and Oro Fino.*—Between Quartz Valley and Oro Fino eek lies a narrow, low ridge of porphyritic hills, extending about 7 iles N. and S., and containing quite a number of small but generally h veins of quartz. The valleys on both sides of the ridge are rich in acer gold, and are worked by hydraulicking.

*Queen Mine* (Quartz).—It is on Cherry Creek, 10 miles S.W. from reka, at 4,700′ elevation. The vein is 1′ wide, trends N. 10° E., and ps 55° E. between greenstone and slate walls. There are two tunnels 5′ apart vertically; the upper one cross-cuts 45′ to the ledge, and

from it a 75′ winze has been sunk. One mile distant from the mine, Lime Gulch, is a double arrastra, driven by a 24′ overshot wheel dur the five months water-season. Two men are employed. D. Barnes, Yreka, owner.

*Quinn & McConnel* (*Campbell & Austin*) *Mine* (River).—It is a bar in the Klamath River, just below the mouth of Humbug Cre at 1,900′ elevation, and comprises 44½ acres. The gravel-pit is 40′x and 32′ deep; three such pits are worked by means of wing-dams each season of six months. The gravel requires some blasting. A H.P. engine is used for hoisting and pumping, and a 6 H.P. engi drives a dynamo for lighting purposes. Work is continued night a day by 20 Chinese and 4 white men; four tubs of gravel of about 2,0 lbs. each are hoisted per shift. Dr. Songer et al., of Yreka, lessees.

*Ramus Mine* (Drift).—See our XIIth Report, p. 290. This lies Scott River, 1½ miles N. of Scott Bar, at 1,890′ elevation, and is work by drifting in the second bench. Joe Ramus, of Scott River, owner.

*Ramus Mine* (Drift).—It is on Klamath River, 1¾ miles below Ha burg Bar, at 1,660′ elevation, and is worked by drifting in the seco bench. Charles Ramus, of Oak Bar, owner.

*Red Hill Mine* (Hydraulic).—See our XIIth Report, p. 290. This at the mouth of Knownothing Creek, 2 miles above Forks of Salmo at 1,740′ elevation. Parker & Sons, of Etna, owners.

*Red Hill Mine* (Hydraulic).—It lies on North Fork River, 4¾ mi below Sawyer's Bar, at 2,220′ elevation. The claim is nearly work out. A. Ahlgren, of Sawyer's Bar, owner.

*Red Hill Mine* (Hydraulic).—It is situated on Klamath River, miles below Cottage Grove, at 960′ elevation, and contains 60 acr The bank is 15′ high, with 9′ of gravel. The sluices are 24″ wide, a the No. 2 giant acts under 130′ pressure. Water is obtained fr Runnel's Creek through a ditch ¾ mile long. William Lord, of Orlea Humboldt County, owner.

*Reliable and Extension Mine* (Quartz).—It is a prospect, on Hung Creek, 9 miles from Cole's Station, on the C. & O. R. R., and consists two locations on an E. and W. vein about 2′ wide, dipping N. betwe granite walls. A 200′ tunnel has been driven on the vein. J. L. Coy of Hornbrook, owner.

*Rhinehold Mine* (Hydraulic).—See our XIIth Report, p. 291. Th lies on East Fork of Salmon River, 6 miles E. of Cecilville. The dit from Taylor Creek is 3½′ wide, 2′ deep, and ¾ mile long. There is 4 of 10″ pipe and a No. 1 giant, under 150′ pressure. The bank is high, and all gravel. J. J. Rhinehold, of Cecilville, owner.

*Rider Mine* (Hydraulic).—It is on Little Humbug Creek, 4½ miles of Walker, at 2,325′ elevation. A ditch 1 mile long takes water fr Little Humbug Creek, and delivers it through 175′ of 6″ pipe and wi a 1½″ flexible nozzle. The bank is 30′ high, and has 7′ of gravel. Wh & Rider, of Walker, owners.

*Roberts Mine* (Quartz).—See our XIIth Report, p. 291. It lies at t head of Eddy Gulch, 4 miles S. of Sawyer's Bar, at 3,600′ elevati The vein is exposed in two tunnels, 90′ and 115′ long, and shows 10″ 18″ of white quartz. The ore is treated in an arrastra run by an ov shot wheel. Eddy Roberts, of Sawyer's Bar, owner.

*Robertson Mine* (River).—It is situated on Horse Creek, 15½ mi N.W. of Oak Bar, at 2,280′ elevation. The claim contains 40 acres

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ek-bed and bottom land, and is mined by hoisting the gravel to the face. Power for the derrick and a large Chinese pump is obtained by overshot water-wheel. A Chinese company, owner.

*Robinson Mine* (Placer).—This lies on Mill Creek, 5½ miles E. of Scott r, at 2,560′ elevation. The claim contains 20 acres, and is worked by und-sluicing. J. Robinson, of Scott Bar, owner.

*Roche Mine* (Placer).—It is on Scott River, at Callahan, at 3,330′ vation, and comprises 120 acres. The claim is worked by ground-licing, water being taken from the river through a ditch 1½ miles long.

*Rock Creek Mine* (Hydraulic).—This is on Klamath River, 9 miles ow Cottage Grove, at 1,025′ elevation, and embraces 80 acres. The nk is 100′ high, with 10′ of gravel. The sluices are 24″ wide. Water aken from Rock Creek by a ditch 4′ wide by 2′ deep and 1½ miles g, and delivered through 1,000′ of 11″ and 15″ pipe to a No. 2 and No. 3 giant, under 150′ pressure. Frank Hostetter, of Cottage Grove, ner.

*Roff Mine* (Quartz).—It lies on Indian Creek, 2 miles N.W. of Cecil-le, at 2,680′ elevation. The vein is from 8″ to 12″ thick, and the velopment consists of three tunnels from 40′ to 80′ long. Charles ff, of Cecilville, owner.

*Rosalie Mine* (Quartz).—See Schroeder.

*Rout Mine* (Quartz).—It is on French Creek, 7 miles S. of Etna. e 2′ vein is worked through a tunnel 300′ long. Idle. Charles Rout, Etna, owner.

*Runnel's Creek Mine* (Hydraulic).—This is on Klamath River, 23 les below Cottage Grove, and contains 80 acres, lying at 810′ eleva-n. The bank is 80′ high, with 15′ of gravel on bedrock, mixed with ny large bowlders. A ditch ½ mile long and 3′ wide by 2′ deep takes ter from Runnel's Creek and passes it through 700′ of 11″ to 15″ pipe a No. 3 giant, under 230′ pressure. The sluices are 24″ wide, and ved with block riffles. A large derrick is driven by a hurdy wheel. lliam Lord, of Orleans, Humboldt County, owner.

*Rycroft Mine* (Drift).—It lies on Slide Creek, 6¼ miles S.W. of Calla-n, at 5,570′ elevation, and contains 20 acres. The claim is worked by fting in the creek bank. S. Rycroft, of Callahan, owner.

*Saint Lawrence Mine* (Quartz).—It is situated at the head of Pioneer lch, in Quartz Valley. The vein is 4″ to 24″ wide, lies in porphyry, d dips 40° E. There are two cross-cut tunnels, 130′ and 400′ long, pectively, and a 130′ drift on the vein in the shorter one. A. G. vers, of Fort Jones, owner.

*Salmon Mine* (Placer).—This lies at the mouth of Wildcat Creek, mile W. of Callahan, at 3,270′ elevation, and is worked by ground-licing. M. J. Salmon, of Callahan, owner.

*Salmon River Mine* (Hydraulic).—It is on the North Fork of Salmon ver, 5 miles N.E. of Sawyer's Bar, at 2,800′ elevation, and contains 0 acres, extending about a mile along the river. There are two nches which it is intended to mine. The lower one contains 15′ to 20′ gravel, with the bedrock only a few feet above the river, while the per one lies 80′ higher and has 120′ of gravel. Preparations are de to attack the upper bench first. There are 1,600′ of 15″, 20″, and ″ pipe on the ground, and two No. 6 giants with 6″ and 7″ nozzles. e sluices are 5′ wide, 32″ high, paved with blocks, and are set on a ade of 6″ per box. A ditch 4 miles long is under construction, and

will consist mostly of 5'x 4' flume, with a grade of 12.8' per n
About 1½ miles from the dam a sawmill has been built to furnish
necessary lumber. It has a 25 H.P. engine, a 60" circular saw, and tu
out about 8,000 feet of lumber per day. Salmon River Hydraulic G
Mining and Ditch Co., owner; William Harrington, of Sawyer's l
superintendent.

*San José Mine* (Hydraulic).—This is 1 mile N. of Scott Bar, on
second bench, at 2,350' elevation. Water is taken from Tompk
Creek by a ditch 4' wide, 2' deep, and 10 miles long. Fifteen hund
feet of 18" to 24" pipe and a No. 6 giant, under 200' pressure, are u
Idle. San José Milling, Mining, and Ditch Co., owner.

*Santana Bros. and J. Noe Mine* (Placer).—It is ¾ mile N. f
Hawkinsville, at 2,500' elevation, and contains 50 acres. The gr
bank, from 10' to 12' high, is worked by ground-sluicing, obtaining
required water from springs and gulches on and in the vicinity of Ro
Gulch. The flume is 1,200' long, set on a 4" grade, and furnished v
slat riffles. The dump is into Yreka Creek. Five men are emplo
Santana Bros. and Joe Noe, of Hawkinsville, owners.

*Sargent Mine* (Placer).—It lies on Grouse Creek, 4½ miles E. of Ca
han, at 3,820' elevation. The claim contains 20 acres, and is worked
ground-sluicing. George Sargent, of Callahan, owner.

*Sauerkraut Mine* (Hydraulic).—See our XIIth Report, p. 291. I
situated on Salmon River, 5 miles below Forks of Salmon. The b
is 40' high and the gravel 20'. Two No. 1 giants, under 220' press
and 1,500' of 11" pipe are used. The ditch, taking water from M
house Creek, is 3' wide, 2' deep, and 2 miles long. George McNeal
Forks of Salmon, owner.

*Schroeder Mine* (Quartz).—See our XIIth Report, p. 291. It is r
Deadwood Gulch, 7 miles W. of Yreka, at 5,750' elevation, and c
prises five patented claims, including six blind veins of quartz, kn
as the *Blue*, *Coon*, *Mountain Boy*, *Rosalie*, *Vivian*, and *Way Up*, al
which have a general N. and S. course with a slight easterly variat
and dipping E. at angles varying from 38° to nearly vertical.
formation is slate and diabase. The location of the veins is such t
they can be developed by tunnels driven directly on their strike.
Mountain Boy vein carries a heavy percentage of mispickel, and
furnished considerable nugget gold. Up to date the chief develop
has been on the Rosalie vein, which carries free-milling quartz. Tu
No. 1, 500' above the mill, is on the Mountain Boy; the vein car
mispickel, has been drifted 130', and shows a good grade of or
the breast. Tunnel No. 2 is on the Blue ledge, 350' from No. 1, and
a cross-cut over to the Rosalie 300' long, and a 160' drift along
latter. A 40' winze sunk on the Rosalie below the drift shows a v
averaging 5' in thickness, of a good grade of ore; an intermediate c
going N. on the vein proves the continuance of a good vein. Water
encountered at the bottom of the winze. Tunnel No. 3 is 135' ab
and is also on the Rosalie, and has been driven 1,000' on the vein,
closing a faulting of the vein. About 150' above, also on the Ros
No. 4 tunnel has been driven over 1,200' on the vein; and 140'
higher, tunnel No. 5 is 1,400' in on the same vein. The upper
tunnel, 130' higher, on the Rosalie, is 400' long; the vein from her
the surface has been mostly stoped out. The vein swells and contra
but averages 5' in width; the yield along the vein is likewise varia

ore from the different localities is dumped to the level of tunnel 2 and conveyed thence by a three-rail tramway, with turn-out in dle, on a 27° angle, to the ore-bins in the mill, which hold 130 tons. account of the shelly nature of the wall rock, heavy, close timbering quired in the mine. These timbers are procured abundantly on the perty, at an expense of 1 cent per running foot. The 10-stamp m-mill is run only during the day. It is furnished with Challenge feeders; 800-lb. stamps, dropping 90 times per minute; No. 11 slot ens; aprons set on a ½″ grade to the foot; followed by 4′x 6′ shaking-es, set level, with 3″ throw; and two Frue concentrators. The hinery is all operated by a 36 H.P. engine. The capacity of the is 12 to 13 tons in twelve hours. Nine tenths of the amalgam is ined in the battery. Seven men are employed in the mine and one ne mill. J. H. C. Schroeder, of Yreka, owner.

*chuler Mine* (Drift).—This is on Scott River, at Scott Bar, at 2,050′ ation, and is worked by drifting in the west bank of the river. tin Schuler, of Scott Bar, owner.

*chuler Mine* (Placer).—It is on Slide Creek, 5¼ miles S.W. of Calla-, at 4,730′ elevation. The claim contains 20 acres, and is worked round-sluicing. The bank is 30′ high, and contains many large lders, which are removed by a hand-power derrick. J. M. Schuler, allahan, owner.

*cott River.*—On the headwaters of this stream, in the vicinity of lahan, and especially on the South Fork, rich deposits of gravel are nd. They have been mined for many years, and operations on a e scale are still being prosecuted. Below Callahan the river runs ugh a wide and fertile valley, which is successfully cultivated. d, no doubt, exists here near the bedrock, but the soil is too deep to w of its being mined profitably. The flourishing towns of Etna and t Jones lie in this section. The lower part of the river, for about iles above its mouth, runs through a cañon, and here gold is found he benches on the hillsides and in bars in the river. The village of t Bar lies in the center of this district, and is a center from which plies are furnished. Several rich quartz veins have been found ly, and no doubt many more exist in the neighborhood, awaiting pick of the persevering prospector.

*cott River Mine* (Hydraulic).—It is situated on the South Fork of t River, 2½ miles S.W. of Callahan, at 3,740′ elevation. It embraces claims formerly known as the *Boye*, *Chapman*, *Pettit*, and *Smiley*, isting of about 1,000 acres of partly bench and partly creek-bottom l. It is being piped in two places; at the lower one, water is taken n Boulder Creek by a ditch 2¾ miles long, 3′ wide by 2½′ deep, and h a grade of 25′ per mile, and passed through 1,000′ of 15″ pipe to a 6 giant, under 300′ pressure. The bank is 50′ high, and the gravel, ch contains many small bowlders, is 20′ deep. The 4′x 3′ sluice is forced by a 6′x 4′ flume from the river, 300′ long, with a grade of 26′ mile, to keep the lower end of the sluice clear from debris. A small ick is run by an overshot wheel. At the upper place, water is taken n Fox Creek by a ditch ½ mile long and 5′ wide, 3½′ deep, with a le of 90′ per mile, and delivered through 800′ of 11″ and 500′ of 10″ 8″ pipe to two giants, Nos. 1 and 2, under 180′ to 275′ pressure. sluices are 4′x 4′ and 300′ long, set on a grade of 6″ per box. On second bench, 100′ above these diggings, the gravel lies 20′ deep, in

a bank of 30′ to 50′ high. It is known to be rich, but is not worked present. Scott River Mining Co., owner; F. P. King, of Callah manager.

*Sheffield Mine* (Hydraulic).—See our XIIth Report, p. 291. Wor out and abandoned.

*Sheffield Mine* (Quartz).—See Uncle Sam.

*Shell's Mine* (Drift and Placer).—This lies in Pinery Gulch, in Qua Valley, and is worked both by drifting and ground-sluicing, about inches of water for that purpose being obtained from Emigrant Cr through a 6″ pipe. The bank is 40′ high, and all gravel. Will Shell, of Fort Jones, owner.

*Sherman Mine* (Hydraulic).—It is on Horse Creek, 10 miles N.W Oak Bar, at 2,060′ elevation, and contains 160 acres. A mile of di and 300′ of 7″ pipe give a pressure of 60′ to the No. 1 giant; 200′ of sluices are used. W. B. Morgan, of Oak Bar, owner.

*Shiner Mine* (Hydraulic).—See our XIIth Report, p. 291. This is Klamath River, 9 miles above Happy Camp, at 1,510′ elevation. A N giant, under 150′ pressure, 800′ of 11″ pipe, and 300′ of 18″ sluices on a grade of 8″ per box, are used. The 1-mile ditch collects wa from small gulches. John Shiner, of Happy Camp, owner.

*Shore Mine* (Placer).—It lies on Indian Creek, 3½ miles N. Happy Camp, at 1,500′ elevation, and contains 10 acres. The clain worked by ground-sluicing, water being obtained from Indian Creek a ditch 1 mile long. G. Shore, of Happy Camp, owner.

*Short Mine* (Placer).—See our XIIth Report, p. 292. It is situa on Trail Creek, 14 miles W. of Callahan, and is worked by grou sluicing. W. F. Short, of Callahan, owner.

*Short Mine* (Quartz).—See our XIIth Report, p. 292. It is on T Creek, 10 miles E. of Cecilville. The vein is 4′ thick, and the devel ment consists of 800′ of tunneling. A 2-stamp water-power mill belo to the property. W. Walters et al., of Callahan, owners.

*Shumway Mine* (Hydraulic).—See our XIIth Report, p. 292. Thi on North Fork River, 1 mile above Forks of Salmon, at 1,410′ ele tion, and contains 40 acres. Water is taken from the river, the di being 3′ wide, 2′ deep, and 1 mile long, with a 14′ grade; 500′ of pipe creates a pressure of 80′ on the No. 1 giant, and the sluices are wide with a 6″ grade. The bank is 40′ high. Shumway Bros. Forks of Salmon, owners.

*Sightman Mine* (Hydraulic).—See our XIIth Report, p. 292. It on South Fork of Salmon River, ½ mile below Cecilville, at 2,360′ ele tion, and contains 20 acres. The sluices are 24″x 18″ and have a gr of 6″ per box. The No. 1 giant is supplied with water under 150′ p sure by 300′ of 18″ pipe and a ditch 2 miles long, taking water fr Crawford Creek. George H. Sightman, of Cecilville, owner.

*Silveira Mine* (Placer).—It is situated on the Main Fork of E Gulch, 3½ miles S. of Sawyer's Bar, at 3,150′ elevation, and is wor by ground-sluicing. P. L. C. Silveira et al., of Sawyer's Bar, owners

*Sirly Mine* (Placer).—This lies on Little Humbug Creek, 3 miles of Walker, at 2,140′ elevation. The claim contains 20 acres, and worked by ground-sluicing in the creek-bed. S. H. Sirly, of Wall owner.

*Siskiyou Mine* (Quartz).—It lies 7 miles N.W. from Yreka, on Middle Fork of Humbug Creek, at 2,950′ elevation. The vein, 2′ wi

nds N. and S., and dips 50° E. between porphyry walls. A 160′ ft with 50′ and 100′ drifts has been sunk on the vein, and all show d ore. There is a 4-stamp mill with 600-lb. stamps, driven by an 8 P. engine.

*Siskiyou Mining Co.'s Mine* (Hydraulic).—It is on Klamath River, miles below Happy Camp, at 1,370′ elevation. It contains about 00 acres, and includes the old *Montezuma Hill* property. The com- ny has acquired most of its land only lately, and has just completed itch 4′ wide, 3′ deep, and 11 miles long, to convey water from the ith Fork of Clear Creek. A complete equipment to work the mine a large scale is being "packed" in. The old plant now in use con- s of 2,000′ of 11″ pipe, a No. 4 giant under 150′ pressure, and a ditch vide, 2′ deep, and 2 miles long, taking water from Crawford Creek. e sluices are 4′ wide, and the bank 50′ to 150′ high. Siskiyou Mining , owner; J. D. Fraser, of Fort Jones, superintendent.

*Skunk Hill Mine* (Hydraulic).—See our XIIth Report, p. 292. This n Scott River, 2 miles below Scott Bar. Worked out and abandoned.

*Slap-jack Mine* (Hydraulic).—See Finley.

*Smiley Mine* (Hydraulic).—See Scott River Mine.

*Smith Mine* (Drift).—It lies on Klamath River, 5 miles above ppy Camp, at 1,460′ elevation, and is worked by drifting in the ond bench. L. P. Smith, of Happy Camp, owner.

*Smith Mine* (Hydraulic).—See Scott River Mine.

*Smith & Merriam Mine* (Quartz).—See our XIIth Report, p. 292. It situated in White's Gulch, 4½ miles S.E. of Sawyer's Bar, at 3,360′ vation. The vein is 4′ wide, and dips 40° S. There is a 250′ tunnel the vein, from which about 100 tons of ore have been mined. John Smith and Henry M. Merriam, of Sawyer's Bar, owners.

*South Fork of North Fork of Humbug Creek Mine* (Placer).—It is ar the headwaters of Humbug Creek, and is worked by 4 Chinese. A inese company, owner.

*Specimen Mine* (Quartz).—It lies at the head of Craig's Gulch, 5 les W. of Callahan, at 4,120′ elevation. A shaft, 20′ deep, exposes a n of quartz 2½′ thick, dipping 40° E. L. S. Barr et al., of Callahan, ners.

*Spencer* (*Goodenough*) *Mine* (Quartz).—See our XIth Report, p. 445. is 12 miles N.W. from Yreka, at 4,500′ elevation. The property braces eight claims. The vein varies from a few inches to several t, courses E. and W., and dips about 35° to 40° S.E. The pay-ore found in lenticular masses. It was opened by a 5′x 12′ incline shaft, d to be 240′ deep, which is at present partly filled. A drift from the ttom extended 180′ W., and this block was stoped out to the surface. tunnel with 30′ of backs has been driven on the vein. The property s been dismantled, and is going to decay under the presumption that it worked out, which means, in this case, all the visible ore-supply tracted. Bank of Yreka, owner.

*Spengler Mine* (Placer and Hydraulic).—See Humbug Flume and ining Co.

*Squaw Gulch Mine* (Hydraulic).—It is on Sugar Creek, 4 miles N.W. Callahan, at 3,420′ elevation, and contains 60 acres. Water is taken m Sugar Creek, through 8 miles of ditch 2½′ wide, 2′ deep, and deliv- ed through 1,000′ of 6″ pipe to a No. 2 giant, under 100′ to 250′ pres- re. The sluices are 600′ long, 20″ wide, and have a fall of 6″ per box.

The bank is 12′ high, and all gravel. Jean Boulangeot, of Callah owner.

*Standard Mine* (Quartz).—See Claughry.

*Star Mine* (Quartz).—This is in Hull Gulch, Quartz Valley, 3,300′ elevation. The vein is 4″ thick, and is developed by three tu nels, 70′, 160′, and 250′ long, respectively. David Star, of Oro Fi owner.

*Steamboat Mine* (Drift).—It is situated on McAdams Creek, 4 mi N.E. from Fort Jones, at 3,625′ elevation, and embraces several claims, in all about 2½ miles along the course of the creek. The ground was worked in earlier days, but bedrock has never be reached, on account of the difficulty experienced in handling such large amount of water as was encountered. The present owners sinking a 6′x 14′ three-compartment shaft, which will be 100′ deep reaching bedrock, and are equipping it with a double-drum hoist a three Dow pumps with 16″ steam cylinders, 14″ pump cylinder, stroke, and 8″ discharge pipes, to be driven by a 75 H.P. engine under lbs. pressure. A drain tunnel is planned and started to come up course of the creek for 1½ miles, where it will reach bedrock; it will driven from three shafts, equipped with donkey engines. Ten men w be employed, the crew to be increased as required. N. Bennett a A. C. Brokaw, owners; A. C. Brokaw, of Fort Jones, superintendent.

*Steel Mine* (Quartz).—It is situated in Evans Gulch, Quartz Vall at 3,550′ elevation. The developments consist of a tunnel 160′ long the vein, a shaft 160′ deep, and a cross-cut 60′ long to meet it at bottom. The vein contains 8″ to 18″ of quartz. Charles Sargent, Fort Jones, owner.

*Stenshaw Mine* (Hydraulic).—This lies on Klamath River, 15 mi below Cottage Grove, at 860′ elevation, and contains 160 acres. T bank is 50′ high, and has 10′ of gravel; a No. 3 giant, under 1 pressure, and 800′ of 11″ pipe are used. Water is obtained from seve small creeks through a ditch 2 miles long. Sam Stenshaw, of Cott Grove, owner.

*Sterling Mine* (Quartz).—It lies on Hungry Creek, 9 miles W. Cole's Station, on the O. & C. R. R. The 5′ vein courses E. and W., a dips N. between syenite walls, the quartz carrying about 1% sulphur The developments include a 90′ shaft, and at a point 400′ distant a 1 cross-cut tunnel to the vein. There is a 30 H.P. steam-engine motive power for the hoist and 10-stamp mill. Idle. J. Sterling, Coles, owner.

*Sterling Mine* (Quartz).—This is on the East Fork of Deadwo Creek, 13 miles N.W. of Fort Jones. The vein is about 16″ thick, a consists of white quartz, with specks of zinc-blende and copper and ir pyrites. Two tunnels, 100′ to 175′ long, connected by a winze, are driv on the vein. Will Crocker, of Fort Jones, owner.

*Stewart Mine* (Hydraulic).—See our XIIth Report, p. 293. It is White's Gulch, a tributary of Indian Creek, 7 miles N. of Fort Jones, 3,230′ elevation. About 300 inches of water are obtained from Whit Gulch through 1,000′ of 6″ and 8″ pipe, and used through a No. 1 gi with 2″ nozzle. The sluices are 24″x 14″, and paved with block riff The bank is 10′ high, with 2′ of gravel. J. Moore and Luke Shaw, Fort Jones, owners.

*Stewart Mine* (Quartz).—See Last Chance.

*Stillwell Mine* (Placer).—See our XIIth Report, p. 293. Worked out d abandoned.

*Stockton Mine* (Drift).—See our XIIth Report, p. 293. It lies in the nery, in Quartz Valley. Idle. Stockton Gravel Mining Co., owner; Rodbruch, of Fort Jones, agent.

*Stowell Mine* (Hydraulic).—See Scott River Mine.

*Sugar Hill Mine* (Drift).—See our XIIth Report, p. 293. It is situ-d on Fox Creek, 5 miles S.W. of Callahan, at 4,560′ elevation, and ntains 20 acres. It is worked by drifting in the creek-bed. Bedrock serpentine. George W. Smith, of Callahan, owner.

*Sulphur Spring Mine* (Placer).—It is on the Left Fork of Empire eek, ½ mile above the forks and 2 miles above the Empire Mine, at 50′ elevation. There are two claims, containing 16′ in depth of free avel, on a slate bedrock; 12′ of this is ground-sluiced; the remaining 4′, xt the bedrock, has to be picked and shoveled into the sluices. Six xes, set on a 6″ grade, are supplied with Hungarian and pole riffles. ne man is at work. T. B. Southwark, of Gottville, owner.

*Summerville Mine* (Hydraulic).—See our XIIth Report, p. 293. This s at Summerville, and extends 5 miles along the South Fork of lmon River. The ditch taking water from the river is 6′ wide, 4′ ep, and 15 miles long. The bank varies from 10′ to 30′, and the avel averages 8′ deep. The sluices are 4′x 3′, with block riffles. There e more than 2 miles of 11″ to 24″ pipe, and three No. 2 giants, work-g under 350′ pressure, on the claim. Spooner, Smith & Campbell, of na, owners.

*Sunshine Mine* (Quartz).—It is on Sucker Gulch, in Quartz Valley, 3,110′ elevation. There are two veins, 8″ and 10″ thick, respectively, out 3′ apart, and the developments consist of a shaft 30′ deep and a nnel 120′ long, both on the vein. The dip is 20° E., and the walls rphyry. E. Erno, of Fort Jones, owner.

*Sweringen Mine* (Placer).—This is on Indian Creek, 10 miles N. of appy Camp, at 1,960′ elevation, and contains 20 acres. Worked by ound-sluicing. B. Sweringen, of Happy Camp, owner.

*Swiss Bar Mine* (Placer).—It is in the vicinity of Gottville. Idle.

*Taylor Mine* (Placer).—It is situated on North Fork River, 4½ miles ove Sawyer's Bar, at 2,750′ elevation, and contains 80 acres. The ater-supply obtained from small tributaries is not sufficient, and it is tended to build a flume 2 miles long to Russian Creek. There are 200′ 10″ pipe and two No. 2 giants on the claim. H. P. Taylor Mining ., owner; J. Henry Smith, of No. 431 California Street, San Francisco, cretary.

*Taylor & Co.* (*Taylor & Maplesden*) *Mine* (Drift).—See our XIIth eport, p. 293. It lies at Hamburg Bar, on Klamath River, at 1,760′ evation. The bedrock lies 30′ below water-level, and the drifts are der the village. Access is gained through an incline 80′ long. About ) cars of gravel are hoisted per day. Power is obtained from an under-ot wheel 16′ in diameter and 8′ wide, the water being taken from the ver through a short ditch, 6′ wide. E. R. Taylor et al., of Hamburg, wners.

*Tea Bar Mine* (Hydraulic).—See our XIIth Report, p. 293. This lies n Klamath River, 9 miles below Cottage Grove, at 970′ elevation, and ntains 100 acres. The bank is 12′ high, with 7′ of gravel; two giants, os. 2 and 4, under 100′ pressure, and 700′ of 11″ pipe are used. Water

is taken from Tea Creek by a ditch 3′ wide, 2′ deep, and 1 mile lo
Hay Mining Co. (Chinese coöperative), of Cottage Grove, owner.

*Ten Eyk Mine* (Hydraulic).—It is on Klamath River, 25 miles bel
Cottage Grove, at 1,020′ elevation, and contains 80 acres. Water
taken from Ten Eyk Creek through a ditch ½ mile long, and deliver
through 1,000′ of 10″ pipe to a No. 2 giant, under 200′ pressure. T
sluices are 22″ wide. The bank is 20′ high, and consists almost entire
of large bowlders, which are disposed of by a large derrick, with ir
double-gear hoist, driven by a 6′ hurdy wheel. A mill with a gang-s
furnishes lumber for the claim. William Lord, of Orleans, Humbol
County, owner.

*Texas Mine* (Hydraulic).—This is on Klamath River, 2½ miles bel
Happy Camp, at 1,300′ elevation, and contains 160 acres. The claim
worked by the plant of the Grider Mine, which it adjoins. Ah Ock,
Happy Camp, owner.

*Thompson Mine* (Drift).—It is situated on South Fork of Salm
River, 25 miles N.W. from Trinity Center, Trinity County, at 4,8
elevation, and adjoins the Deep Bank claim. It includes 30 acr
There are two tunnels driven into a 200′ bank of gravel; the upper o
is 80′ above bedrock and 120′ long, with an E. and W. branch tun
100′ long, with breasts 6′ high and 15′ wide. The other tunnel is on be
rock, 300′ long, also breasted 6′ high and 15′ wide; here the gravel pa
50 cents per foot. Three men are at work. W. Thompson, of Abran
Trinity County, owner.

*Tiger Mine* (Quartz).—See our XIth Report, p. 437. It is situated
Hull Gulch, in Quartz Valley, at 3,250′ elevation. The 8″ vein
developed by a 300′ tunnel. C. A. Sargent, of Fort Jones, owner.

*Tiger Fork Mine* (Placer).—This lies on Sugar Creek, 5 miles N.W.
Callahan. A ditch, 3 miles long, from Sugar Creek, is being dug to supp
the necessary water. George Fader, of Callahan, owner.

*Tillman Mine* (Drift).—It is on White's Gulch, 3½ miles E. of Sa
yer's Bar, at 2,660′ elevation. The claim is worked by drifting in t
bank of White's Creek. Frank Tillman, of Sawyer's Bar, owner.

*Tim Cardoza Mine* (Placer).—See Long Gulch Mining Co.

*Tompson Creek Bar Mine* (Hydraulic).—It lies at mouth of Tomps
Creek, 10 miles above Happy Camp, at 1,500′ elevation. Idle. Jo
C. Wood, of Seiad, owner.

*Tom Rogers' Mine* (Placer).—It is ¼ mile S. from Hawkinsville,
2,500′ elevation. The gravel bank, from 15′ to 18′ high, is worked
ground-sluicing, with the occasional use of a pipe with 2″ nozzle. T
cuts are being brought up on opposite sides of Canal Gulch by the u
of 300 miner's inches of water from the old Sproul or lower Greenho
ditch; the water season lasts four months; 1,600′ of sluices are used
washing the gravel. Eight men are employed. Phillippe Bros. et a
of Hawkinsville, owners.

*Uncle Sam Mine* (Quartz).—It is on the divide between Sucker Cre
and the Middle Fork of Humbug Creek, 12 miles N.W. from Yreka,
3,600′ elevation. The vein trends N.E. and S.W., and dips about 4
E. in porphyritic rock. The developments consist of a 140′ shaft, wi
drifts at 60′ and bottom, extending 155′ S. and 150′ N., respective
There is an 8 H.P. steam hoist. Two men are employed. J. N. Cons
and A. E. Thrash, of Yreka, owners.

*Uncle Sam* (*Sheffield*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 433 and 293. This is at the head of White's Gulch, 7 miles N. of Sawyer's Bar, at 5,140′ elevation. The vein averages 3½′ of quartz, dipping 45° S.E., between porphyry hanging-wall and slate foot-wall. The mine is worked by four cross-cut tunnels, from 100′ to 150′ apart. They are respectively 120′, 250′, 370′, and 550′ long, and the drifts at their faces are 400′, 250′, 100′, and 300′ long. A 3½′x 4′ air-shaft 364′ deep connects with the lowest drift. The ore-shoot is 120′ long and dips to the N.E. The ore is run down by a tramway 360′ long to the 16-stamp water-power mill, with stamps of 850 lbs. each, power being obtained by a hurdy wheel. Edmund Sheffield and Estate of E. R. Sheffield, of Sawyer's Bar, owners.

*U. S. Mine* (Drift).—See Kellner, Doescher & Mahr.

*Varga's Mine* (Placer).—It lies on Eddy Gulch, 3 miles S. of Sawyer's Bar, at 3,100′ elevation. The claim is worked by ground-sluicing; bowlders being removed by hand derrick. Frank Varga, of Sawyer's Bar, owner.

*Vivian Mine* (Quartz).—See Schroeder.

*Volcano Mine* (Quartz).—See our XIIth Report, p. 293. It is situated on Evans Gulch, in Quartz Valley, at 3,200′ elevation. The 200′ tunnel on the vein shows 8″ of quartz, lying between porphyry walls. C. A. Bargent, of Fort Jones, owner.

*Walker Mine* (Placer).—It is situated at the junction of Humbug and Cayuse creeks. It is worked from a small reservoir, with water from Cayuse Creek, by one man. William B. Walker, of Yreka, owner.

*Way Up Mine* (Quartz).—See Schroeder.

*Welker Mine* (Hydraulic).—It lies on Grouse Creek, 6 miles E. of Callahan, at 4,050′ elevation, and contains 40 acres. Water is derived from Grouse and Carmen creeks through a ditch 2¼ miles long, built on a grade of 12.8′ per mile, and delivered under 250′ pressure to a No. 2 giant by 1,000′ of 8″ pipe. The sluices are 30″ wide, 300′ long, and have a grade of 8″ per box. Welker Sons, of Callahan, owners.

*Wells Mine* (Placer).—It is on Horse Creek, 16 miles N.W. of Oak Bar, at 2,330′ elevation, and contains 20 acres. Worked by ground-sluicing in the creek-bed. A. Wells, of Oak Bar, owner.

*Whistlehear* (*Barry & Co.*) *Mine* (River).—See our XIIth Report, p. 277. This is in the bed of North Fork River, 2 miles below Sawyer's Bar, and comprises 23 acres. Bedrock lies 6′ below water-level, and the bar of gravel is 20′ deep. A derrick, with 66′ boom, raises the material to the sluices. Two overshot wheels, 12′x 2½′, furnish power for a Chinese pump and the reel, water being taken from the river by a 3′x 15″ flume, 1¼ miles long. The sluices are 15″x 15″, with pole riffles, and are set on a grade of 5″ per box. Barry, James & Blake, of Sawyer's Bar, owners.

*White's Mine* (Placer).—It lies on Little Humbug Creek, 3½ miles E. of Walker. The claim contains 40 acres, and is worked by ground-sluicing. Harry White, of Walker, owner.

*White Elephant Mine* (Quartz).—It is situated on White's Gulch, 6 miles S. of Sawyer's Bar, at 4,140′ elevation. The 4′ ledge of quartz is exposed by several open cuts. Smith & Eveleth, of Sawyer's Bar, owners.

*Wilke's Mine* (Placer).—This lies in Russian Creek, 9 miles N.E. of Sawyer's Bar, at 2,970′ elevation, and embraces 20 acres. The mine is

worked by ground-sluicing, water being obtained from the creek, through ½ mile of ditch. Wilke Bros., of Sawyer's Bar, owners.

*Wilkinson's Mine* (Placer).—It is on North Fork of Salmon River, 3 miles above the Forks, at 1,600′ elevation, and contains 20 acres. Water for ground-sluicing is obtained from small tributaries. Wilkinson, Campbell, et al., of Forks of Salmon, owners.

*Willard & Hickman Mine* (Hydraulic).—See our XIIth Report, p. 294. This is on Klamath River, ½ mile below Hamburg Bar, at 1,910′ elevation, and contains 20 acres. Water is taken from Max Creek by a ditch 4′ wide, 2′ deep, and ½ mile long, and delivered through 800′ of 11″ to 20″ pipe to the giant, under 200′ pressure. The sluices, 300′ long and 20″ wide, are provided with block riffles, and have a grade of 8″ per box. The claim lies on the second bench, 150′ above the river. Willard & Hickman, of Hamburg, owners.

*Willheim Mine* (Placer).—See our XIIth Report, p. 294. It lies on North Fork of Wildcat Creek, 5 miles W. of Callahan, at 3,980′ elevation, and is worked by ground-sluicing. W. A. Willheim, of Callahan, owner.

*Williams Mine* (Drift).—This lies on Horse Creek, 13 miles N.W. of Oak Bar, at 2,120′ elevation, and contains 20 acres. It is worked by drifting in the bank of the creek. S. H. Williams, of Oak Bar, owner.

*Williams Mine* (Hydraulic).—See our XIIth Report, p. 294. It is situated on Salmon River, 6 miles below the Forks, at 970′ elevation, and embraces 20 acres. A No. 1 giant, under 150′ pressure, is supplied by 700′ of 11″ pipe and a mile of ditch, water being obtained from Louis Creek. The sluices have a 6″ grade, and are 24″ wide. Louis Williams, of Forks of Salmon, owner.

*Wilson Mine* (River).—It is at the mouth of Deadwood Creek, 10 miles N. of Fort Jones, and embraces 20 acres in the bottom of the valley. Bedrock lies 14′ below the surface, and the gravel is hoisted by a whim. The diggings are drained by a 6″ pump rigged to a small water-wheel. F. L. Wilson, of Fort Jones, owner.

*Windsor Mine* (Drift).—This is on Slide Creek, 5¾ miles S.W. of Callahan, at 4,900′ elevation, and contains 20 acres. It is worked by drifting in the bank of the creek. Dan Wilson et al., of Callahan, owners.

*Wingate Hill Mine* (Hydraulic).—See our XIIth Report, p. 294. It lies on Klamath River, 9 miles below Happy Camp, at 1,580′ elevation. There are 2,300′ of 11″ and 15″ pipe and a No. 2 giant on the claim. The sluices are 20″ wide, have a grade of 8″, and are paved with block riffles. The ditch is 3′ wide, 2′ deep, 7 miles long, and takes water from Oak Flat Creek. The bank is 80′ high, with 50′ of gravel. Horace Gasquet, of Happy Camp, owner.

*Wood Bar Mine* (Placer).—See our XIIth Report, p. 294. It is situated on Klamath River, 5 miles above Happy Camp, at 1,400′ elevation. Bedrock lies 10′ below water-level. Idle. James Camp, of Fort Jones, owner.

*Wood Mine* (Drift).—See our XIIth Report, p. 294. This lies on Klamath River, 6 miles below Seiad, at 1,560′ elevation, and is worked by drifting in the bank of the river. W. H. Wood, of Seiad, owner.

*Wood & Fehely Mine* (Hydraulic).—It is on Klamath River, 2 miles below Seiad, at 1,660′ elevation, and contains 60 acres. Water is obtained from Portuguese Creek by a ditch 1½ miles long; 500′ of 11″ pipe and a No. 4 giant, under 180′ pressure, are used. The bank of

gravel is 40′ high. The sluices are 300′ long, 22″ wide, and are set on a grade of 6″ per box. Wood & Fehely, of Seiad, owners.

*Wright & Fletcher Mine* (Hydraulic).—See our XIIth Report, p. 294. It is at Oro Fino, at 2,900′ elevation, and contains 40 acres. The bank is 35′ high, and shows 20′ of gravel; the bedrock is a soft micaceous slate. The equipment consists of 1,500′ of 22″ pipe, a No. 1 giant with 2″ nozzle, under 180′ pressure, and 1,500′ of 5′ sluices, with block riffles. A hydraulic elevator raises the gravel 25′ from bedrock into the sluices. Headlights are used to illuminate the mine at night. About 3,000 inches of water is obtained from Kidder Creek by a ditch 7′ wide, 3′ deep, and 4½ miles long, and having a grade of 12.8′ per mile. Wright & Fletcher, owners; Hank Wright, of Fort Jones, superintendent.

*Yellow Jacket Mine* (Quartz).—It is a new location, and lies on Barkhouse Creek, 7 miles W. of Walker, at 3,470′ elevation. It adjoins the Commodore Mine. A 15′ open cut discloses a vein with 15″ of quartz, dipping 40° S.W. Otto Hipler et al., of Oak Bar, owners.

## MILLS IN SISKIYOU COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Amazon | Water | 10 | 850 | 24 | | | | | | |
| Ampback | Water | 5 | | | | | | | | |
| Bonanza | Water | 5 | | | | | | | | |
| Black Bear | Water | 16 | 640 | 17 | 4 | Frue | | | | |
| Bloomer | Water | 5 | 650 | | | | | | | |
| Boyle* | Steam | 4 | | | | | | | | |
| Caribou | Water | 2 | 400 | 1½ | | | | | | |
| Columbia | Water | 10 | 750 | | | | | | | |
| Comstock No. 2 | Steam | 5 | 400 | 6¼ | | | | | | |
| Daggett & Smith | Water | 5 | 550 | 7½ | | | | | | |
| Empire | Water | 5 | 750 | 7 | | | | | | |
| Evening Star | Water | 4 | 700 | 6 | | | | | | |
| Gilta | Water | 4 | 650 | 6 | | | | | | |
| Golden Ball | Steam | 20 | 650 | | | | | | | |
| Golden & Eveleth | Steam | 4 | 750 | | | | | | | |
| Green Mountain | Steam | 5 | | | | | | | | |
| Hartstan | Water | 5 | | | | | | | | |
| Hegler | Steam | 5 | 600 | 5 | | | | | | |
| Highland | Water | 2 | | | | | | | | |
| Hook Him | Steam | 10 | 800 | 25 | 2 | Frue | | | | |
| Hooper's "Custom" | Water | 5 | 500 | 3¾ | | | | | | |
| Hungry Hill | Water | 4 | | 3⅓ | | | | | | |
| Jumbo | Water | 10 | | | | | | | | |
| Knownothing | Water | 4 | 650 | | | | | | | |
| Last Chance | S. and W. | 5 | 700 | 10 | | | | | | |
| Low Hill | Water | 4 | 650 | | | | | | | |
| Luna | Water | 4 | 550 | 3 | | | | | | |
| Methodist Creek | Water | 1 | 250 | ¾ | | | | | | |
| Mount Laurel | Water | 16 | 650 | 20 | | | | | | |
| Oregonian | Water | 2 | 850 | 1½ | | | | | | |
| Oro Fino | Steam | 5 | | | | | | | | |
| Osceola | Water | 5 | 850 | 8 | | | | | | |
| Quartz Hill | Water | 10 | 750 | 12 | | | | | | |
| Schroeder | Steam | 10 | 800 | 26 | 2 | Frue | | | | 48 sq. ft. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Siskiyou | Steam | 4 | 600 | | | | | | | | |
| Sterling | Steam | 10 | 750 | | | | | | | | |
| Uncle Sam | Water | 8 | 850 | | | | | | | | |
| Warren & Green | Water | 5 | 650 | 7½ | | | | | | | |

In addition to stamps the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SISKIYOU COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Banner | Water | | Arrastra | | 1½ | | | | | | |
| Bender | Water | | Huntington | | | | | | | | |
| Boyle | | 1 | Huntington | 3′ | | | | | | | |
| Cannon | Water | | Arrastra | | | | | | | | |
| Carey | Water | | Arrastra | | 1¼ | | | | | | |
| Challenge | Water | | Arrastra | | 1¼ | | | | | | |
| Commodore | Water | | Arrastra | | 5 | | | | | | |
| Goodenough | Water | | Arrastra | | 2½ | | | | | | |
| Hiyon | Water | | Arrastra | | 1¼ | | | | | | |
| Little Queen | Water | | Arrastra | | 1½ | | | | | | |
| Queen | | 2 | Arrastra | 10′ | | | | | | | |
| Roberts | Water | | Arrastra | | | | | | | | |
| Sterling | Water | | Arrastra | | 1¼ | | | | | | |
| Tiger | Water | | Arrastra | | 1½ | | | | | | |

## Sonoma County.

This county lies north of Marin County, and facing the ocean. contains a large area of very fertile farming land, and is well wate by the Sonoma, Petaluma, Santa Rosa, and Russian rivers. Qui silver, iron ore, aragonite, coal, chromic iron, etc., are found in co mercial quantities. In the southern part of the county occurs a ha dark-colored basalt, which is extensively used for the manufacture paving-blocks, more than 2,000,000 being sold annually.

*Silver Queen* (Quartz).—This lies on Austin Creek, 5 miles N. of Ca dero, at 1,520′ altitude. It embraces the *Leopard* and the *Silver Qu* claims. The vein matter, a diabase dike in schistose rocks, is 30′ thi and carries gold in pyrite. A 100′ cross-cut tunnel was run 100′ bel the croppings. In the face, a soft, wet clay was struck, which could be timbered successfully. Another tunnel, 150′ below the former, w then started, and is now 230′ long. It is estimated that 30′ more w cut the vein. Isaac Gray, of Healdsburg, owner.

MILLS IN SONOMA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concen trators |
|---|---|---|---|---|---|
| Indian<br>Metallic<br>Red Paint | Steam | 10 | 850 | 5 | (3 sets b stones |

## Sutter County.

This is preëminently an agricultural and horticultural county, a its mineral industries are of very little importance. The soil sandy loam on the eastern side, changing to dark, heavy clay westwa and yields large crops of grain and fruit, without irrigation. T greater part of the county possesses an inexhaustible supply of s terranean water, which may be obtained by pumping from wells 25′ 100′ in depth. Natural gas has been struck in a number of shall wells about Yuba City, but is not utilized, and no deep wells have b bored to test the supply. Clays suitable for brick-making occur in valley as superficial deposits, and trachytic lava, suitable for ro masonry and macadam, is found at the Marysville Buttes. Prospecti has been done thereabouts for gold and coal, with indifferent succ The county has the advantage of shipping both by water and by rail

Gold has been mined to a limited extent from places in ravines at Marysville Buttes. Enough is said to have been obtained, when wa was plentiful, to yield wages to the miners. There are no rec developments. See our Xth and XIth Reports, pp. 691 and 471.

## Trinity County.

*Ack Chung Mine* (Hydraulic).—It is a Chinese company, working ound situated in Weaver Basin, about 1½ miles S.W. of Weaverville, joining the Souden claim, whose waste-water they pick up and use. k Chung Co., of Weaverville, owners.

*Ah Lin Mine* (Placer).—It is on New River, 2 miles below Francis, d contains 20 acres, lying at 1,590′ elevation. Worked by ground-icing. Ah Lin, of Francis, owner.

*Alaska Mine* (Quartz).—It is 7 miles N. of Coleridge, at 2,700′ alti-le, and contains six locations with parallel veins between slate walls, rrying an average width of 2½′ of quartz of a ribbon structure, with pper sulphides; they all trend N.E., and dip about 60° S.E. A cross-tunnel has been driven 100′ to the main vein and drifted both ways equal distance, giving 100′ of backs. A winze sunk 36′ on the north l of the drift shows a 4′ vein on the bottom. The quartz is reduced a 13′ arrastra, driven by a 30′ overshot wheel, with water from Yel-w Jacket Gulch; after leaving the arrastra the pulp passes through 7′ of 12″x 24″ sluices, set on a 2″ grade per box. W. F. Junkans, C. nkans, and P. Luella, of Weaverville and North Fork, owners.

*Amy Balch Mine* (Quartz).—It is on Thorn Gulch, 1 mile S. from adwood, at 2,100′ approximate altitude, and comprises three locations a porphyritic belt, traversed by numerous quartz seams, varying in ith from a seam to 5′, and carrying auriferous sulphurets. This belt, out 100′ wide, lies in slate, and trends E. and W. At a distance of and 55′ apart, three tunnels, each about 100′ long, have been driven m Thorn Gulch into the porphyry; the ore when extracted is sacked l rolled down the hillside to a 9′ arrastra, driven by an 18′ overshot eel, using the tailings water from the Brown Bear mill, and crushing ons per day. Thorn Bros., of Deadwood, owners.

*Anderson Mine* (Placer).—It lies on Trinity River, 10½ miles above ina Flat, and contains 20 acres, lying at 825′ altitude. Worked by ker. Charles Anderson, of Burnt Ranch, owner.

*Antone Mine* (Hydraulic).—It is on New River, 3 miles below Fran-, and contains 20 acres, lying at 1,620′ altitude. The water is taken m a little gulch and collected in a small reservoir. The bank is 30′ h, and all gravel; 100′ of 7″ hose delivers the water to a 2″ nozzle, der 50′ pressure. José Antone, of Francis, owner.

*Applegate & McCulley Mine* (Placer).—It is situated at the mouth Fischer Gulch, 3 miles S. from Dedrick, at about 400′ elevation, and nprises 20 acres on a portion of the old channel of Cañon Creek. rked by ground-sluicing through 8 boxes, 12″x 14″, set on a 5″ grade, l lined with Hungarian and slat riffles. Water is derived from cher Gulch. Applegate & McCulley, of Dedrick, owners.

*Armstrong Mine* (Quartz).—It is on Slide Creek, at New River City, at 00′ altitude. The vein is 9″ wide and courses N.W., with a dip of 20° E. Considerable surface work was done, which is now caved. Idle. ller & Son, of Denny, owners.

*Badgely Mine* (Quartz).—It is on Grizzly Creek, a tributary of the rth Fork of Trinity River, 18 miles N. of Coleridge, at 4,160′ altitude. is a new discovery. A 10′ open cut exposes a 10″ quartz ledge. dgely Bros., of Coleridge, owners.

*Bailey Mine* (Quartz).—It is situated on Fischer Creek, 4 miles from Dedrick, at about 2,600′ elevation, and comprises three full clai There is small vein, from 6″ to 18″ in width, between slate and dior trending N.E. and dipping S.E. The development consists of a sh and 100′ tunnel. G. Bailey, of Dedrick, owner.

*Bald Point Mine* (Hydraulic).—See Paulsen & Hughes.

*Bartred Mine* (Quartz).—See our VIIIth Report, p. 638. It is Deadwood Mining District.

*Bates Mine* (Hydraulic).—It is 3 miles S.W. from Lewiston, at abo 1,800′ altitude, and contains 100 acres on a low bar of Trinity Riv The gravel bank is 20′ deep, and is worked with a No. 4 giant with nozzle; the water being delivered through 700′ of 15″ to 13″ pipe a under 60′ pressure. The water (second right) is obtained from Gr Valley Creek, and is conveyed through 3 miles of ditch, 8′ on top, 5′ bottom, and 3′ deep, with a capacity of 300 miner's inches. The ta flume is 500′ long, 4′ wide, paved with wooden blocks, and dumps into Trinity River. Owned and worked by 10 Chinese.

*Bates & Tourtellote's Mine* (Hydraulic).—This is on the west bank the East Fork of Stewart's Fork of Trinity River, 3 miles N. of Mine ville, and contains 40 acres. The bank is 60′ high and shows two d tinct qualities of gravel; the upper portion carries coarse, bright go while the lower carries a black scaly gold. Water is taken from Meade ditch. Bates & Tourtellote, of Minersville, owners.

*Begel & Day Mine* (Hydraulic).—It is situated on Cañon Creek mile S. of Dedrick, at 1,950′ altitude, and consists of a front and ba gravel channel. Work was carried on in the former during the p season with the aid of an extension water-power derrick, with 90′ boo to handle large bowlders. The 45′ bank of gravel is attacked with giant, using 1,200 inches of water through 700′ of 15″ and 13″ pipe, a 4″ and 5″ nozzles, under 250′ pressure. The water comes from East Fork of Cañon Creek through two ditches, each about 1¾ mi long, 3′ wide, and 2′ deep, and may be delivered under 800′ head. T tail-flume consists of 14 boxes, 12′ long, 4′ wide, and set on a 7″ gra they are paved partly with riffles and wooden blocks, and dump i Cañon Creek. The gold is medium coarse, and is cleaned from boxes every two weeks. Seven men are employed. T. Begel and Day, of Junction City, owners.

*Berger Mine* (Hydraulic).—It is on Cañon Creek, 5 miles S. of D rick, at 1,700′ altitude, and contains 200 acres, covering portions of former channel of Cañon Creek. The gravel bank is from 50′ to high, the lower 12′ constituting the pay; the working-pit is 50′x 80′x 1 and has a bedrock sluice and 8 boxes of 4′x 3′ flume, which dump into Cañon Creek. This flume is set on a 10″ grade, and lined w riffles and blocks. The coarse gold rarely gets below the third b The claim is supplied with water from Gwinn and Rarick gulch through three ditches, known as the Empire, 2½ miles long; the Ea 1¾ miles, and the Rarick Gulch, 1½ miles long; each being about wide on the bottom, 18″ deep, and with grades varying from to 1⅜″ per rod. The water is delivered through 800′ of pipe under 1 pressure, and the water season lasts from December to July. Th men are employed. Berger Estate, of Junction City, owner.

*Big Bar Mine* (Hydraulic).—It is on Trinity River, at Big Bar, 1,320′ altitude, and comprises 40 acres. Water is taken from D

eek by a ditch 2 miles long. A No. 1 giant, under 80′ pressure, and 0′ of 8″ pipe, are in use. The bank is 40′ high, with 20′ of gravel. The ices are 24″ wide. W. A. Paterson, of Big Bar, owner.

*Big French Bar Mine* (Drift).—It is on Trinity River, 1½ miles above ylor Flat, at 1,340′ altitude. The tunnels are made in the bank of e river, above water-level. Warren, Van Winkle & Co., of Big Bar, ners.

*Black Crow Mine* (Hydraulic).—It is 1 mile E. of Douglas City, and nsists of 300 acres of an old channel. Water is taken from Indian eek through a ditch 9 miles long, 3½′ on bottom, 6′ on top, and 2½′ ep, with a grade of ⅜″ to the rod, and having a capacity of 1,500 ner's inches. Two men are driving a tunnel through the rim rock for outlet. J. Bowie, of Weaverville, owner.

*Blakemore Mine* (Hydraulic).—It is on a bar of Trinity River, 5 les N.E. from Lewiston, at 1,800′ elevation, and contains 225 acres. ie gravel bank is from 15′ to 30′ deep, and carries coarse and scaly ld in the loose gravel. The water is taken from Baker's Gulch through o ditches, ½ and ¾ mile long, 18″ wide on the bottom, 3′ on top, and ″ deep, and delivered under 150′ pressure. The water season is usu- y six months. Mrs. Blakemore, of Lewiston, owner.

*Bloss & McClary Mine* (Hydraulic).—See our Xth and XIIth Re- rts, pp. 699 and 307. It is situated in Sec. 5, T. 36 N., R. 7 W., ar Trinity Center, at 2,300′ altitude. During the past season only ¼ re of ground was worked off, with 5 men on one shift. Bloss & cClary, of Trinity Center, owners.

*Blue Jacket Mine* (Quartz).—It lies W. of the Trinity River, 1½ miles W. of Carrville, at 2,600′ elevation, and embraces two full claims. The in, averaging about 6′ in width, follows the contact between serpentine d porphyry. It trends N.E. and dips about 45° N. The quartz is low- ade. The 50′-wide serpentine belt penetrates the porphyry, and car- s quartz along both sides of the contact. A shaft, 4′x 4′ in the clear, s been sunk 40′, and two cross-cuts driven 75′ and 200′ long, to cut the in. Water-power can be had from Coffee Creek. G. L. Carr, of Carr- le, owner.

*Bodecker Mine* (Placer).—It is on Grizzly Creek, 17½ miles N. of Cole- ge, at 4,050′ altitude. The claim comprises 20 acres, and is worked by ound-sluicing. — Bodecker et al., of Coleridge, owners.

*Boles Mine* (Placer).—It lies on Quinby Creek, a tributary of New ver, 7 miles S. of Francis, and contains 20 acres, at 1,720′ altitude. orked by ground-sluicing, water being derived from Quinby Creek. les & Lundberg, of Francis, owners.

*Bonanza Mine* (Quartz).—It is in Digger Gulch, ¾ mile from Miners- le, at 2,300′ altitude, and contains two claims. The vein, about 3′ le, strikes N.W., and dips 35° N.E., in slate. The vein is richest ere it carries calcite, while the quartz generally is low-grade and ries a small percentage of copper sulphide. Some extremely rich ecimens of gold-bearing calcite have been taken from this vein. ere are two incline shafts; the deeper is 98′, and shows 3′ of quartz the bottom. At 70′ a short drift proved that the pay-shoot dipped ay from the shaft. Along the side of the gulch several tunnels have en driven into the hill, at different levels, some of which have veloped gold-bearing quartz. J. H. Tourtelotte, of Minersville, owner.

*Bonanza Mine* (Quartz).—See Cleveland Consolidated, and our XIIt Report, p. 307.

*Bonanza King Consolidated Mine* (Quartz).—It is on a high ridg 9½ miles N.E. from Trinity Center, at 6,600′ elevation at the upper, an 6,300′ at lowest, works. The vein trends N.W., and dips N.E. into th mountain, between porphyritic walls, and varies from 30″ to 5′ i width. The quartz carries iron, copper, and lead sulphides, with coars free gold. Owing to the favorable location, four tunnels have bee started on the slope of the mountain, 150′ apart; the three upper on are little more than open cuts from 12′ to 15′ deep; the lowest is a tunn 128′ on the vein. Upon the mill site, 5,500′ from the mine and 1,90 vertically below the tunnel, a 5-stamp mill has recently been erecte to run by both water and steam power; the former acts on a 6′ Knigl wheel under 300′ pressure, and the water is taken from Cedar Creek b ¼ mile of ditch, with a grade of 5″ to the rod. Eight men are employe — Volmers et al., of Trinity Center, owners.

*Boomer Mine* (Quartz).—It is on Slide Creek, ½ mile S.E. of Denn at 4,850′ elevation. The ground has been stoped 200′ in depth, an allowed to cave. For several years this caved material has been ru through sluices, and some gold obtained from it. At present the pro erty is leased, and a tunnel is being driven, with a view of finding th vein. In October, 1895, it was 230′ long, and still in caved groun The vein is said to be 12″ thick, to dip 40° N.E., and to strike N.W and S.E. A 3-stamp mill, with 450-lb. stamps, driven by an oversh wheel, belongs to the property. T. J. Ladd, of Denny, owner.

*Boyd Mine* (Placer).—It lies on Emigrant Creek, 4 miles S.W. New River City, at 3,710′ elevation. A 3′x 2′ ditch, ½ mile long, co veys water from Emigrant Creek to a small reservoir. The claim co tains 20 acres, and is worked by ground-sluicing. A. Boyd, of Denn owner.

*Brizard Mine* (Quartz).—It is at the head of Eagle Creek, ½ mile of Cœur, at 4,450′ altitude. The vein is 8″ thick, and lies betwe diabase walls. The developments consist of a 200′ cross-cut tunn and at its end a winze on the vein, 100′ deep. The dip is 45° N.E., an the strike N.W. and S.E. A 2-stamp mill, with 400-lb. stamps, ar driven by an overshot water-wheel, belongs to the property. A. Brizar of Arcata, Humboldt County, owner.

*Brown Mine* (Placer).—It is on Coffee Creek, about 6 miles N.W. fro Carrville, at 3,000′ elevation, and consists of 80 acres along the cree The claim is just being opened, using water from Coffee Creek, throu a ditch ¼ mile long, 3½′ wide on bottom, and with a grade of 3″ per ro The loose gravel is run off by ground-sluicing through 13 boxes, square, set on 1½″ grade, and paved with blocks. Bedrock has not be reached yet. Two men are employed. — Brown et al., of Carrvil owners.

*Brown Mine* (Placer).—This is on Emigrant Creek, 3½ miles S.W. New River City, at 3,670′ elevation. The claim is worked by groun sluicing, water being derived from Emigrant Creek. L. Brown, of Denn owner.

*Brown Bear Mine* (Quartz).—See our VIIIth, Xth, and XIIth Repor pp. 639, 713, and 308. It is situated at Deadwood, at 3,600′ elevatio in the center of an extended mineral belt, with a general E. and W trend, and comprising 200 acres. The two principal claims, the *Lo*

*ance* and the *Monte Cristo*, are about 120′ apart, gradually diverging ing west, dipping about 75° N., and crossing slate, porphyritic granite, d lime formations. The quartz carries lead, zinc, copper, and arsenical rite in connection with lime. Some of the ore-shoots are of high ade, especially where the fissures traverse the porphyritic granite; in ssing through the slate belt the quartz is of a lower grade. The prin- al ore-shoot is on the Last Chance, and it has been followed 1,800′; e shoots on the Monte Cristo are shorter, but of higher grade. The ne has been worked through an extended system of tunnels, as well through a 4′x 6′ (in the clear) two-compartment shaft, to a depth of 0′ perpendicularly. The deepest workings are 700′ in perpendicular pth, showing good pay-ore in the bottom. Only the higher grades ve been extracted, leaving considerable bodies of low-grade ore (said average $5 per ton) throughout the old works. Over 12 miles of nnels and drifts have been driven; one of these passes through the tire ridge from Mill to Doliffe Gulch, on the Last Chance vein. om the lowest level the ore and water are raised 200′ by steam-power the tunnel on the mill level. A tunnel, that would be about 1,500′ length, could be run, and would tap the vein 200′ below the present rks, or 400′ below the mill tunnel, and thus afford more economical rking, a new mill being built at its mouth, or the old one moved. venty men are employed in the mine and ten in the mill; besides, ere are five crews of tributers working on the Monte Cristo and four ws on the Last Chance vein. Mrs. H. Martin and C. H. Watts, of n Francisco, and J. Melton, of Placerville, owners; C. Dobler, of Dead- od, superintendent.

*Buck's Ranch Mine* (Quartz).—It is 3 miles E. of Dedrick, at 2,700′ itude. The vein trends N.E. and S.W., and dips S. It is prospected rough two tunnels on the vein; the upper being 300′, and the lower 90′ ng. There are two Huntington mills, 3½′ and 5′, run by a 6′ Pelton heel, with water taken from North Fork of Big East Fork of Cañon eek. Mason & Thayer, of Douglas City, owners.

*Bully Choop Group* (Quartz).—See Cleveland Consolidated.

*Bully Choop* (*Occidental and Original Bully Choop*) *Mine* (Quartz).—e our VIIIth and XIIth Reports, pp. 640 and 308. These claims are ated on the northwest side of Bully Choop Mountain, 20 miles S. of o, at 6,000′ elevation. Since our last Report no developments have en made; experiments with methods of working the ores resulted in thing definite. There is a 3-stamp mill, with 850-lb. stamps, an 8½′ rastra, and one Triumph concentrator, working 6 tons per day with a H.P. steam-engine. Nine men are employed in the mine, three in e mill, and two teamsters. Frick & Davis, of Lewiston, owners.

*Bunker Hill Mine* (Quartz).—It is a prospect, near Lewiston, at 1,900′ evation. The vein strikes N.E., and is said to contain cinnabar, sides gold. Mrs. Blakemore et al., of Lewiston, owners.

*Canadian Bar Mine* (Hydraulic).—It is at Taylor Flat, on Trinity ver, at 1,200′ elevation. The claim lies on an old channel, 200′ above e river, and has a bank of gravel 25′ thick. A 3′x 2′ ditch, 1 mile ng, to convey water from Canadian Bar Creek, is under construction. vid Finch, of Natoma, Sacramento County, owner.

*Carrie Mine* (Quartz).—It is on Slide Creek, ½ mile N.W. of New ver City, at 4,600′ altitude. The 10″ vein courses N.W. and S.E., and ps 25° N.E., between diabase walls. Considerable ore has been taken

out from near the surface, but the mine is now idle. George Ferney, Denny, owner.

*Cedar Flat Mine* (Hydraulic).—It lies on Trinity River, 10 mil below Taylor Flat, at 1,120′ altitude. Idle.

*Chapman & Fischer Mine* (Hydraulic).—See our Xth Report, p. 70 It lies in Secs. 19, 29, and 30, of T. 33 N., R. 10 W., about 6 miles fro Junction City, at 1,900′ elevation, and comprises 138 acres. There a three benches of gravel, carrying the largest bowlders of any claim o the river. Some of the largest specimens of platinum found in th State came from this claim. Water from Soldier's Creek is used, ar the season lasts about five months. Chapman & Fischer, of Junctic City, owners.

*China Creek Mine* (Hydraulic).—It lies on New River, 12 miles belo Francis, at 950′ elevation. The bank is 40′ high, with about 30′ gravel, partly cemented next the bedrock. Water is taken from Chir Creek by a 3′x2′ ditch 1 mile long; 900′ of 12″ pipe delivers it to a N 2 giant, under 180′ pressure. The sluices are 30″ wide and paved wi block riffles. W. J. Nichols, of Burnt Ranch, owner.

*Chinese Gravel* (*Coyle, Kong He Kong*) *Mine* (Hydraulic).—See our X and XIIth Reports, pp. 700 and 309. This is situated at the outskir of Trinity Center, at 2,300′ altitude. The property contains over acres on the benches of a former channel of Trinity River, with a ge eral N.E. course. The bank is from 70′ to 90′ high; the lower 20′ gravel; the remainder, red clay and soil, carrying a little fine go throughout. One acre was washed during the past season, and 36 acres all. Water is derived from Swift Creek through two ditches, the Blo & McClary lower ditch, and a second smaller one below; these are miles long and have a capacity of 1,200 miner's inches, which a delivered to a No. 3 giant with 5″ nozzle, under 80′ pressure, from reservoir, through 1,300′ of 15″ to 11″ iron pipe. A derrick, with 6 boom, is worked with a 16′ overshot wheel. The flume consists of 3 boxes, of 12′ each, 3′ wide, and set on a 2½″ grade per box, dumpi into Trinity River. The water season lasts ten months. Seventee Chinese work the claim. Ong Dean et al., of Weaverville, owners.

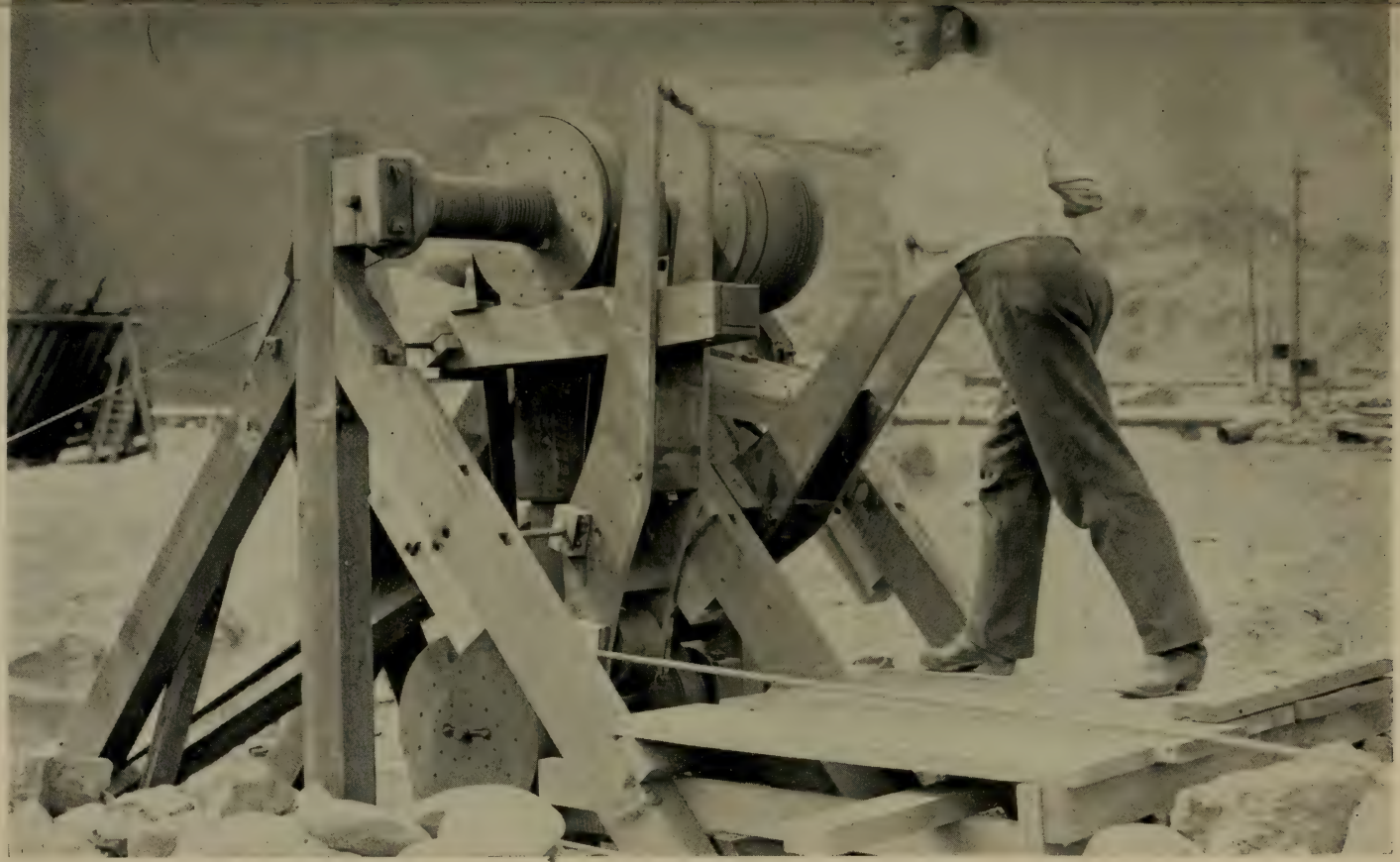
*Chloride Mine* (Quartz).—See our XIIth Report, p. 309. It is at t head of Cañon Creek, 2½ miles N.E. of Dedrick, at over 5,000′ elevatio Since our last Report, a new tunnel has been started at the west end the claim, and is in at present 750′ on the vein. Four men are workir S. L. Blake, C. W. Smith, and H. R. Given, of Weaverville, owners.

*Clark Mine* (Placer).—It is on Pony Creek, 7 miles above Francis, 2,070′ altitude, and contains 20 acres. Water for ground-sluicing taken from Pony Creek. Clark & Borien, of Francis, owners.

*Cleveland Consolidated* (*Bully Choop*) *Group of Mines* (Quartz).—S our VIIIth and XIIth Reports, pp. 640 and 310. This property consis of two locations, which are situated on the southwest side of Bul Choop Mountain, at 5,500′ to 6,000′ elevation. Idle. R. G. Hart et a of Hart, Shasta County, owners.

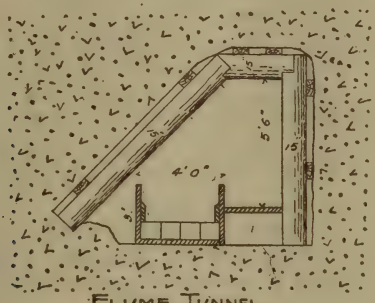
*Clinton Mine* (Placer).—It is on Emigrant Creek, 4½ miles S.W. New River City, at 3,750′ elevation, and contains 20 acres. Water f ground-sluicing is taken from Emigrant Creek. William Clinton, Denny, owner.

*Columbia Mine* (Quartz).—It is a prospect, near Lewiston, at 1,9( altitude, with a N.E. vein. Mrs. Blakeman and H. Springstedt, Lewiston, owners.



Conveyor Reels of Cie Francaise de Hydraulic.

*Compagnie Française des Placers Hydrauliques de Junction City Hayes & Pickett) Mine* (Hydraulic).—See our Xth and XIIth Reports, p. 704 and 308. This company's mine is situated 1 mile from and opposite Junction City, at 1,700′ elevation, and contains two benches of the former channel of the river, comprising over 1,300 acres. The upper bench is being worked in four or five pits, the giants being placed at the angles to avoid being caved upon; three are always in place, using 7″ and 8″ nozzles. The bank being very high, derricks cannot be used to remove the bowlders without great danger of being covered up and destroyed, consequently the bowlders were blasted, causing a heavy outlay for powder and labor, besides a rapid wearing of the wooden blocks. To reduce these expenses, the present manager devised and applied an ingenious use of blocks, cables, and a carrier or trolley to remove the bowlders from the face of the bank. Bowlders up to 2 tons in weight are picked up and conveyed to the back end of the pit. (See p. 445.) Between the Hayes & Pickett ground a new pit has been opened, with an outlet through a short bedrock tunnel. The usual method of timbering tun-



FLUME TUNNEL.

els has been somewhat changed to reduce the amount of excavation and yet furnish sufficient height for a workman to walk along the flume, as shown in the cut The company has one of the finest water-rights in Trinity County, and 3,200 miner's inches of water are used. The main ditch from Cañon Creek is 8½ miles long, 7½′ wide on top, 4½′ on bottom, and 3½′ deep, with a grade of 9.6′ per mile. A suspension bridge carries the water in two pipes across Trinity River, and the ditch is being enlarged to a capacity of 6,000 miner's inches. Thirteen hundred inches of water for the Pickett claim is brought from McKinney and Mill Gulches to a reservoir above the pit. The present pipe-line is 4,000′ long. Twice as much ground was washed in 1895 as in 1894. The entire pit is lighted with electric arc lights, the dynamo being driven by a 3′ Pelton wheel, which also furnishes the power to the windlass manipulating the trolley on the cable. The bedrock cut, carrying the flume, is lighted by 10 incandescent lights of 16 candle-power, supplied from the same dynamo. From 40 to 50 men are employed, the work being carried on night and day. A French syndicate, owner; Messrs. Comenge, of Paris, France, president; E. Saladin, of Junction City, manager.

*Coyle Mine* (Hydraulic).—See Chinese Gravel.

*Daisy Mine* (Quartz).—It is about 4 miles N.W. of Lewiston, at 1,960′ elevation. The 1,500′ by 600′ claim carries three parallel veins trending

N. 35° E., two of them being nearly vertical; the third and most e
erly dips 60° N.W., and toward the others. They vary from a
inches to 2′ in width, and lie between a quartz porphyry foot-wall
a slate hanging-wall, with occasional chloritic casing. The quartz c
ries a heavy percentage of suphurets, mostly iron, but with some zi
blende and galena. On the first, or most easterly vein, 1″ to 2′ wi
the developments are a 150′ tunnel, a 50′ inclined shaft, and a 45′ v
tical shaft below the tunnel. On the second vein above is a 14′ shaft, a
on the third vein, still higher up the hill, is a 6′x 8′ perpendicular
shaft. Two men are at work. Mrs. Blakemore and H. Springstedt,
Lewiston, owners.

*Dannenbrink Mine* (Hydraulic).—It is about 5 miles S. from Dedri
at 1,960′ elevation, and contains 250 acres, including part of an
back channel, and on the front a bar of Cañon Creek, known as
Red Flat placer claim. On the bar portion of the ground some drifti
is being done through two tunnels, 300′ and 125′ long. The bank of
main pit varies from 30′ to 100′ in depth, and is capped with 10′ of s
the gravel carries a large percentage of bowlders. Water is deriv
from Gwinn Gulch through three ditches; 250 inches through a ½ m
ditch, 32″ wide on bottom, 2′ deep, and with a grade of 2″ per rod; 1
inches from the Eagle ditch, in which the claim owns a quarter intere
and the Rarick ditch, 1½ miles long, 2′ wide, and 18″ deep; deliveri
the water through 400′ of 9″ and 7″ pipe to a No. 1 giant, under 3
pressure. Season lasts five months, and ¼ acre was worked the l
year. Four men are at work. Dannenbrink Estate, of Junction, own

*Dark Horse Mine* (Quartz).—See Smith.

*David Evans Mine* (Hydraulic).—See our Xth Report, p. 705. Th
is part of the Red Hill property near Junction City, owned by Day
Begel, and since transferred to a French syndicate.

*Deer Creek Mine* (Quartz).—See Smith.

*Diener Mine* (Hydraulic).—See Minersville Hydraulic G. M. Co.

*Dixon Mine* (Drift).—It is situated on Rattlesnake Creek, 14½ mil
N. of Coleridge, at 3,350′ altitude, and contains 20 acres. It is a bar
the bank of the creek, worked by drifting. John Dixon, of Colerid
owner.

*Dockery Mine* (Placer).—See Ong Dean.

*Don Juan Point Mine* (Hydraulic).—It lies on Trinity River, 8 mil
below Taylor Flat, at 1,200′ elevation. Water is taken from Don Ju
Creek by a ditch, 1 mile long. A No. 1 giant, under 200′ pressure, a
850′ of 8″ pipe, are used. The bank is 45′ high, and all gravel. Th
sluices are 24″ wide, paved with block riffles, and set on a grade of
to the box. W. Husted & Co., of Big Bar, owners.

*Eastman Mine* (Hydraulic).—See Jim Sing.

*Ehni Mine* (Drift).—It is on Rattlesnake Creek, 16 miles N. of Col
ridge, at 3,450′ altitude. It is a bar on the bank of the creek, and co
tains 20 acres. John Ehni, of Coleridge, owner.

*Emmet Mine* (Quartz).—It is 1¾ miles N.W. from Deadwood, at 2,40
elevation. The vein runs N. of E., and dips 75° N.; it is 4′ wide, betwe
slate and porphyry walls, and carries galena and arsenical pyrite.
is worked through several cross-cut tunnels, and 187′ is the longest.
new one has been lately started, 230′ below the other workings. Th
claim is well supplied with timber, and employs 3 men. Shields Do
ohoe and G. Hollingsworth, of Deadwood, owners.

Rock-Conveyor—Compagnie Francaise des Placers Hydrauliques.

*Enterprise Mine* (Quartz).—See our VIIIth Report, p. 643. Thi situated 9 miles N.W. of North Fork, at 2,100′ altitude. The vein to 2′ wide, courses N.W., and dips 20° E. Worked through a tunnel

*Evans Bar Mine* (Hydraulic).—It is 5 miles S. of Junction City 175′ elevation, and consists of 100 acres on a bar and bench of Trin River. The bank is 20′ high, of which 8′ is gravel and 12′ soil; the gra contains some large bowlders. Evans Bar Creek furnishes the wa through two ditches, ¾ and ½ mile long, supplying 800 inches under 1 pressure. Two giants, with 5″ and 7″ nozzles, and two lines of 15″ pi 1,300′ and 900′ long, respectively, are used. The water season la eight months. There are two bedrock cuts, each 300′ long, with 300 4′ and 3′ flumes, set on 7″ and 6″ grades, respectively, and paved w wooden blocks. The gold is both fine and coarse. Six men are e ployed. H. H. Carr & Son, of Junction City, owners.

*Excelsior Mine* (Quartz).—This is ¾ mile S.E. of New River City, 5,125′ elevation. There are five tunnels, from 100′ to 200′ long, throu which the ore has been extracted. The vein is 8″ thick, and lies nea horizontally between diabase walls. A 6-stamp mill, with 480-lb. stam driven by an overshot water-wheel, belongs to the property. Fra Colgrove, Jr., of Denny, owner.

*Excelsior Mine* (Quartz).—This is 15½ miles N.W. from Ono, Sha County, in Sec. 9, T. 31 N., R. 8 W., at 5,560′ elevation. The ve 1′ to 3′ wide, lies between slate walls, trends N. 20° E., and dips abo 55° E. Two shafts, 5′x 5′ in the clear, and 60′ and 75′ deep, have be sunk on the vein; a 40′ tunnel also has been driven. The quartz carr a large percentage (sometimes as high as 10%) of a good grade of s phurets, mostly iron and copper. The rock is reduced in a circular m similar to a Bryan roller, 6′ in diameter with four revolving disks, 2′ diameter with 2″ tires, running on a 5″-wide flat steel ring, surround by a No. 4 (30-mesh) punched screen. The pulp discharges on a can apron leading to sluice-boxes, and 1 ton a day is crushed. The pow is furnished by a horse. Two men are employed. J. T. Lockhardt a Murray Estate, owners.

*Ferguson Mine* (Placer).—It is on Trinity River, 9 miles above Chi Bar. It comprises 160 acres of nearly all gravel, lying at 840′ altitu A ditch 1½ miles long is being dug to bring water from Sharpar Cre S. Ferguson et al., of Burnt Ranch, owners.

*Fischer Gulch and Bonanza Mine* (Quartz).—This is a prospect, ne the head of Fischer Gulch, on Cañon Creek, 9 miles N. from Junct City, at 2,600′ elevation. It contains two claims, with a vein cours N.E., and dipping 50° to 70° S.E. between slate and diorite walls. 100′ cross-cut has been run to the vein and drifts turned both ways it for short distances; the north one connecting with a 60′ shaft. Thr men are at work. S. L. Blake and H. R. Given, of Weaverville, owne

*Forget-Me-Not Mine* (Quartz).—It is on the east side of Trinity Riv 4 miles N.W. of Trinity Center, at 2,600′ elevation. It consists of t full claims on the same vein, which courses E. and W. (parallel to a 900′ S. of the Strode Mine), and dips 65° S., with an average width 10″ in a porphyritic belt. Three tunnels have been driven: No. 1, the vein, 15′; No. 2, a cross-cut to the vein, and turned on it 45′ ea No. 3, a cross-cut 85′ in length, needs extending 20′ to tap the vein. T quartz carries sulphurets, as well as hematite and black iron ore. T ore is sledded to the 9′ arrastra, 1 mile N.E. of Carrville, driven by

overshot wheel, with 20 inches of water obtained from Copper Creek ough an 800′ ditch, during six months in the year. The arrastra y be run constantly by digging 1½ miles of ditch from Scorpion Creek. L. Carr, of Carrville, owner.

*Fountain Head and Thanksgiving Mines* (Quartz).—They are 5 miles W. of the town of North Fork, on the Trinity River, at about 2,400′ itude, and embrace two claims. The vein, averaging 2′ in width, rses N. and S., and dips 20° E. between greenstone walls. There are e tunnels, one above the other, on the vein, the longest of which is but 200′. A 20 H.P. engine runs a 5-stamp mill, with 650-lb. stamps, pping 6″ to 7½″, 95 times per minute, and crushing 6½ tons per day. ere are also four Frue vanners. H. Junkans, of Weaverville, owner.

*Frick & Davis* (*Henry Clay*) *Mine* (Quartz).—It is about 1½ miles W. of Deadwood, at 2,700′ altitude. The vein courses a little N. of and dips 50° to 70° N. The vein is about 4′ wide, within porphyic walls; the quartz carries considerable sulphurets. Two tunnels ve been driven; the upper one 250′, and lower one 400′ long; a 60′ ft has been sunk below the tunnel level. The ground between tunis is stoped for 150′ in length. At the mouth of the gulch on Deadod Creek is an old arrastra belonging to the property, run by water en from Deadwood Creek. Frick & Davis, of Lewiston, owners.

*Gilzean Mine* (Quartz).—It is a new prospect, situated in Deadwood, about 3,400′ elevation. The vein, which crops out in Mill Gulch, nds E. and W., dips S. between porphyritic walls, and is about 2′ de. Three short tunnels have been driven on the vein; the longest is 8′. The middle tunnel is being extended. C. E. Gilzean, of Deadwood, ner.

*Globe Mine* (Quartz).—See our XIIth Report, p. 310. It is 5 miles NE. from Dedrick, at 5,500′ altitude. Since our last Report, the mine s been shut down, on account of litigation. Six men are preparing resume active operations. R. Woodburn, of Dedrick, owner.

*Gold Dollar Mine* (Hydraulic).—See Paulsen & Hughes.

*Gold Leaf and Great Eastern Mines* (Quartz).—See our XIIth Report, 311. They lie 10 miles W. from Castella, Shasta County, and consist two claims on a vein which trends N.W., and dips 45° S. between rphyry walls. J. N. White et al., of San Francisco, owners.

*Golden Chest Mine* (Quartz).—See our VIIIth Report, p. 641. It is the East Fork of Trinity River, 15 miles N.W. of North Fork, at 00′ altitude. The vein, about 18″ wide, trends N.W., and dips 80° W. between slate and porphyritic walls. It is worked through three nnels, 200′, 70′, and 120′ long, respectively. Belonging to the property a 5-stamp mill, with 650-lb. stamps, and one Frue and one Triumph ncentrator. The water-power is derived from the East Branch of the st Fork, through 1¼ miles of ditch, carrying 500 inches, and delivered a 4′ Pelton wheel, under 100′ pressure. Four men are employed. ssrs. Drexler & Whittier, of San Francisco, owners.

*Golden Gate Mine* (Quartz).—It lies on Slide Creek, ½ mile N.W. of w River City, at 4,600′ elevation. The vein averages 10″ in width, d dips 15° N.E. between diabase walls. The development consists a tunnel 150′ long on the vein; the ground above it is stoped. Idle. s Gutzen, of Denny, owner.

*Good Friday Mine* (Hydraulic).—See our XIIth Report, p. 311. It 3 miles S. of Junction City, at 1,800′ elevation, and contains 80 acres

on an old bench of Trinity River, with a bank from 60′ to 70′ hi
The water is obtained from adjoining gulches; the water season is sh
T. C. Post and T. E. Jones, of Junction City, owners.

*Gray Eagle Mine* (Quartz).—This mine is 3 miles N. of Centervil
at 3,500′ elevation. The vein courses E. and W., and dips about 60°
between porphyry and slate walls, showing a 2′ vein of free-milling o
without sulphurets. Two men are at work. F. Demick and P.
Baker, of Trinity Center, owners.

*Gray Mare Mine* (Quartz).—See Smith.

*Gribble Mine* (Hydraulic).—See our XIIth Report, p. 311. It i
miles S. of Junction City, at about 1,800′ elevation, and comprises
acres. Idle since last Report. Mrs. Gribble, of Junction City, own

*Grover Cleveland Mine* (Quartz).—It is on Slide Creek, ½ mile W.
New River City, at 4,500′ altitude. There are an 80′ shaft, a 250′ cro
cut tunnel, and some shallow surface workings. The vein is 8″ wi
stands vertically, and courses N.W. and S.E. Idle. Fred Loring,
Callahan, Siskiyou County, owner.

*Haas Mine* (Hydraulic).—See our Xth and XIIth Reports, pp. 7
and 311. It is 1 mile W. of Junction City, on the east side of Trini
River, at about 1,700′ elevation, and contains 160 acres. During t
past year 4 acres of top soil have been stripped, leaving 5′ of gra
to be washed. The present ditch is to be enlarged. F. G. Haas,
Junction City, owner.

*Halz Mine* (Hydraulic).—This is on Quinby Creek, 6 miles E.
Francis, at 1,600′ altitude, and contains 23 acres. The water is fu
nished from a small tributary through a 2′ ditch ¾ mile long; 300′
7″ hose delivers the water to a 2″ nozzle, under 60′ pressure. T
sluices are 24″ wide and the bank is 30′ high, and all gravel. Halz
Stabell, of Francis, owners.

*Hansen Mine* (Placer).—This is on Trinity River, 9½ miles abo
China Flat, Humboldt County, at 640′ altitude. Water for groun
sluicing is derived from small, wet weather streams. J. Charles Hanse
of Burnt Ranch, owner.

*Hardtack Mine* (Quartz).—It is situated ½ mile N. of New River Cit
adjoining the Ridgeway Mine, at 4,750′ altitude. The vein is about 1
wide, and dips 35° N.E. in diabase. The developments consist of
inclined shaft 200′ deep and 400′ of drifts. Idle. T. J. Ladd, of Denn
owner.

*Hard Times Mine* (Quartz).—It is on Slide Creek, at New Riv
City, at 4,450′ altitude. A tunnel 60′ long and several open cuts di
close a vein of quartz 2′ thick, lying nearly flat. Fullmore & Mill
of Denny, owners.

*Harvey Mine* (Hydraulic).—See Sam Lee.

*Haskins* (*Hatchet Creek, Shoo-Fly*) *Mine* (Hydraulic).—It is situat
on Hatchet Creek, ½ mile N. of Trinity Center, at 2,300′ altitude, a
comprises 74 acres. The gravel bank is 24′ high and all gravel, whic
being tight next the bedrock, requires powder to loosen it up. O
quarter of an acre was worked the past season. There are two channe
passing through this ground—the Hatchet Creek channel and the o
Trinity channel. The gold is of the cucumber-seed variety. Water
obtained from Buckeye Creek through a 6-mile ditch, with a ¾″ gra
per rod and a capacity of 300 inches, delivered through 600′ of 12″ a
10″ pipe to a No. 1 giant, using 1¼″ and 2½″ nozzles, under 125′ pre

, though 400′ may be obtained. The flume consists of 90 boxes, 5½′ e, set on 1½″ grade, and paved with wooden blocks. The water sea- lasts six months. Three men are employed. A. P. Haskins, of ity Center, owner.

*Hatchet Creek Mine* (Hydraulic).—See Haskins.

*Hawkins Bar Mine* (Hydraulic).—This lies on Trinity River, 15 miles ve China Flat, at 890′ altitude. Water is carried from Hawkins Creek by 2 miles of ditch to a reservoir 2 acres in area. A No. 2 a No. 3 giant, under 240′ pressure, are supplied by 2,400′ of 15″ e. The bank is 10′ to 80′ high, and the gravel is slightly cemented r the slate bedrock. The sluices are 24″ wide, and are paved with k riffles. The claim contains 368 acres and is patented. Jerry ith, of Burnt Ranch, owner.

*Hayes Mine* (Hydraulic).—See Compagnie Française des Placers Hy- uliques de Junction City.

*Haywood & Martin Mine* (Drift).—It is situated on Trinity River, ile above Taylor Flat, and comprises 20 acres of an old bar, lying at 0′ altitude. Haywood & Martin, of Big Flat, owners.

*Headlight Mine* (Quartz).—It is in Red Gulch, 3 miles N. of Trinity ter, and ½ mile E. of the Trinity River, at 3,450′ altitude. The vein kes E. and W., dips 60° S., and shows gossan outcrop, 150′ wide, ween porphyry and slate; the latter forming the foot-wall. A few n cuts have been made across the vein and a cross-cut tunnel has n driven 75′ toward the vein; 75′ more will reach the vein. Timber lentiful. Three men are at work. F. Demick and P. G. Baker, of nity Center, owners.

*Henry Clay Mine* (Quartz).—See Frick & Davis.

*Hidden Treasure Mine* (Quartz).—It is on Slide Creek, 1 mile S. of w River City, at 5,200′ altitude. The developments consist of a 200′ ss-cut tunnel and a 60′ winze on the vein, which is 8″ wide; it lies ween diabase walls, and dips about 45° S. Idle. Ladd & Irving, Denny, owners.

*Highland Bar Mine* (Hydraulic).—It is at Taylor Flat, on Trinity ver, at 1,800′ elevation, and comprises 45 acres. The location was de recently on an old channel half-way up on the side of the cañon. 3′x 2′ ditch, ¾ mile long, and with an 8′ grade, is being dug. The vel is said to be very rich. Pelletrean & Hedges, of Big Bar, owners.

*Himes Mine* (Quartz).—It is on Deacon Creek, 19 miles N.W. of Trinity ter, at 3,400′ altitude, and contains three full claims. The 16″ vein rses N.W., and dips 75° N.E. between serpentine on the east and phyritic rock on the west. The quartz is well mineralized and is uced in a 10′ arrastra, ¾ mile distant, run by a 12′ overshot wheel d 30″ breast, with water from Deacon Creek. Some tunnels have n run on the vein. Three men are at work. W. H. Himes, H. W. rner, and W. R. Patton, of Trinity Center, owners.

*Hirschberger Mine* (Placer).—This lies on Pony Creek, 8 miles above ancis, at 2,200′ elevation. Water for ground-sluicing is taken from ny Creek. Jacob Hirschberger, of Francis, owner.

*Hoboken and Grand Slide Mine* (Hydraulic).—It is situated on New ver, 1½ miles above its mouth, and at 1,100′ altitude. The bank is , and the gravel 20′ high. Water is taken from Bell Creek through a 2′ ditch, 2½ miles long, with a 6′ grade. A No. 2 giant, under 175′ ssure, is supplied through 1,000′ of 12″ pipe. Many large bowlders

occur in the gravel near bedrock. The claim embraces 60 acres. M. Johnson, of Francis, owner.

*Hughes Mine* (Hydraulic).—See Paulsen & Hughes.

*Hunter Mine* (Quartz).—It lies on Eagle Creek, 1 mile W. of Co at 4,500′ elevation. There are several shallow openings, and a tunnel on the claim. The vein is 6″ thick, and dips 40° N.E. betw diabase walls. Idle. T. J. Ladd, of Denny, owner.

*Indian Gulch Mine* (Hydraulic).—It is on an old channel, 9 m S.E. of Douglas City, and contains 160 acres, 25 of which have b worked. The bank is 25′ to 30′ high. The gold is coarse. Indian Cr supplies the 900 inches of water used. Four men are employed. An Rogers, of Douglas City, owner.

*Ingleside Mine* (Hydraulic).—It is on a back bench of the East F of Stewart's Fork, 1 mile N. of Minersville, at 2,350′ elevation, and c sists of 60 acres. The gravel is 30′ deep, with a very heavy percentag rocks and bowlders. The upper layers carry quartz gold; the remain carries a black, scaly gold, most frequent near the porphyritic bedr Water is obtained from the East Fork of Stewart's Fork through 6 m of 2½′ ditch, having 1″ grade per rod and of 500 inches capac delivered, under 200′ pressure, through 700′ of 15″ and 11″ pipe to a 1 giant with 4″ nozzle. The water season lasts throughout the ye The outlet is through a 60′ cut in the bedrock, with 18 boxes of 3′ flu paved with wooden blocks and set on a 9″ grade. Two men are at wo Dunn & Seward, of Minersville, owners.

*Jacob Bros. (Patterson and Low Bar) Mine* (Hydraulic).—See our X Report, p. 707. It is 3 miles W. of Junction City, at 1,450′ altitu and contains 356 acres. This is on the same gravel channel as B Hill, and contains very good ground, but suffers from a lack of wat the present supply comes from Connor Creek and two neighbori gulches, through 1 mile of ditch from each. These ditches are 3′ w on top, 2′ on bottom, with a grade ½″ to the rod and a capacity of inches, delivered, under 80′ pressure, to a No. 1 giant with 4″ nozz The water season lasts four months, in which time half an acre of grou is moved. The bank consists of 45′ of a capping of red clay and lo and 15′ of gravel; powder is required to blast the bowlders. The dur into Trinity River is through 800′ of a deep bedrock cut ending in flume boxes, 4′ wide, set on an 8″ grade, and an undercurrent 6′ wi Clean-ups are made monthly. Two men are employed. Jacob Bros., Junction City, owners.

*Jenkins Mine* (Placer).—It lies on New River, 6 miles below Franc at 1,480′ altitude, and is a new location. A ditch is being dug to furni water. George Jenkins, of Francis, owner.

*Jerusalem Mine* (Quartz).—It is situated in Sec. 9, T. 31 N., R. 8 W at the summit of Bully Choop Mountain, at 5,350′ elevation. The ve trends N.W., and dips N.E., between slate and trachyte. The vein h been cross-cut 30′ without reaching the opposite wall. Two cross-c tunnels have been driven; the first, 300′ long with a 65′ drift on t vein; the second, 80′ below, is 40′ long. A 33′ shaft on the vein will t the upper tunnel. Two men are at work. J. T. Lockhard, of Or Shasta County, owner.

*Jerusalem Bar Mine* (Hydraulic).—It is 9 miles W. of Ono, at abo 3,000′ elevation, and contains 30 acres. The gravel bank is 20′ de and the pit is 60′ wide; the ground is very rocky and carries coar

id; 200 inches of water is taken from Jerusalem Creek through half ile of ditch and delivered, under 60′ pressure, to a small giant through ′ of 8″ pipe. There are 100′ of flume, 18″ wide, and provided with ngarian and pole riffles, which are cleaned once a season. Three n are at work. J. Barnes and J. Moon, of Ono, Shasta County, ners.

*Jim & Co.'s Mine* (Placer).—It is situated in Weaver Basin, west of averville, and is worked by 5 Chinese.

*Jim Sing* (*Eastman*) *Mine* (Hydraulic).—It is at the mouth of East- n Gulch, on Trinity River, 6½ miles from Lewiston, at 2,100′ eleva- n, and contains 114.65 acres, one half of which is worked out. The ire 20′ bank is gravel, and is worked with a giant with 5″ nozzle, and help of a derrick. The gold is distributed throughout the gravel. ter is obtained from Mooney and Eastman gulches; the ditch from former is 3 miles long, 14′ wide on top and 8′ on bottom; the second ch is 6′ wide on top and 4′ on bottom, and gives 100′ pressure. There 1,500′ of 3″ to 11″ pipe. The flume is 2,000′ long, with 7′ dump o Trinity River. Nineteen Chinese are employed. Jim Sing and rtners, of Lewiston, owners.

*Joe Hams Mine* (Hydraulic).—It is 7 miles S.E. from Junction City, about 1,750′ elevation, and contains 60 acres on a bench of Trinity ver. The bank is 40′ high, with 15′ of gravel carrying heavy bowlders xt the bedrock, where the gold is coarse; fine gold is found all through gravel. Maxwell Creek furnishes the water through 2 miles of ditch, wide on top, 2′ on bottom, and 2′ deep, on a grade of 1″ per rod, der 125′ pressure, to the giant using 4″ and 5½″ nozzles. The water ason lasts eight months. During the past season three acres have been rked. The flume consists of 12 boxes 3′ wide, using 2″x 8″ scantling riffles. Clean-ups are made monthly. Three men are employed. E. Reed et al., of Junction City, owners.

*Johnstone Mine* (Quartz).—This is on Grizzly Creek, 18 miles N. of leridge, at 4,160′ elevation. It is a new discovery. Several open cuts pose a 20″ vein. A. Johnstone, of Coleridge, owner.

*Jumbo Mine* (Quartz).—It is on the headwaters of Virgin Creek, 10 les N.W. of Cœur, and is a new discovery. The vein is 8′ thick, nding vertically between walls of decomposed porphyry. W. R. cDowell et al., of Denny, owners.

*Junkans Ranch Mine* (Hydraulic).—This is on Weaver Creek, 1½ les from Weaverville. The gravel is from 25′ to 30′ deep, and the about 150′ wide. Four acres have been worked off. Work is carried with one giant with 4″ nozzle, working under 100′ pressure. Water brought from Brown's Creek through a short ditch, 4′ wide and 30″ ep, carrying from 300 to 400 inches of water. The tail-flume, 3′ wide, th 4″ grade, has 30 boxes, dumping into Weaver Creek. Thirteen inese are employed. Ah Fon & Co., owners.

*Kabuski Mine* (Hydraulic).—It is situated on an old channel of the st Fork of Stewart's Fork, 2½ miles N. of Minersville, at 2,365′ eleva- n. The bank is all gravel, and is worked in two pits from 30′ to 50′ gh, but the bedrock has not been stripped yet. The outlet is through ock cut to the East Fork, with 30′ dump. Water is taken from Strope eek through the Meade ditch, 2½ miles long, to a reservoir with a elf-shooter," from which it is delivered through 300′ of 9″ to 7″ pipe the giant with 4″ nozzle. The flume consists of 12 boxes 3′ wide, set

on a 9″ grade. The water season lasts five months. Two men ar work. J. Kabuski, of Minersville, owner.

*Keatch Mine* (Hydraulic and Drift).—It is on Trinity River, 15 m above China Flat, and embraces 160 acres, lying at 940′ altitu Water is taken from Pony Bar Creek through a 3′ ditch, ¼ mile lo 200′ of 7″ pipe and a No. 1 giant, under 80′ pressure, are used. gravel bank is 30′ high. The water-supply is very limited, and drift is resorted to during the dry season. John Keatch, of Burnt Ran owner.

*Kelley Mine* (Placer).—It lies on Trinity River, 1 mile above Big I at 1,360′ altitude. Water is obtained from Manzanita Creek throug 3′ ditch, 1 mile long. The bank is 60′ high and all gravel. The slu are 12″ wide, set on an 8″ grade. Mrs. M. Kelley, of Big Bar, owne

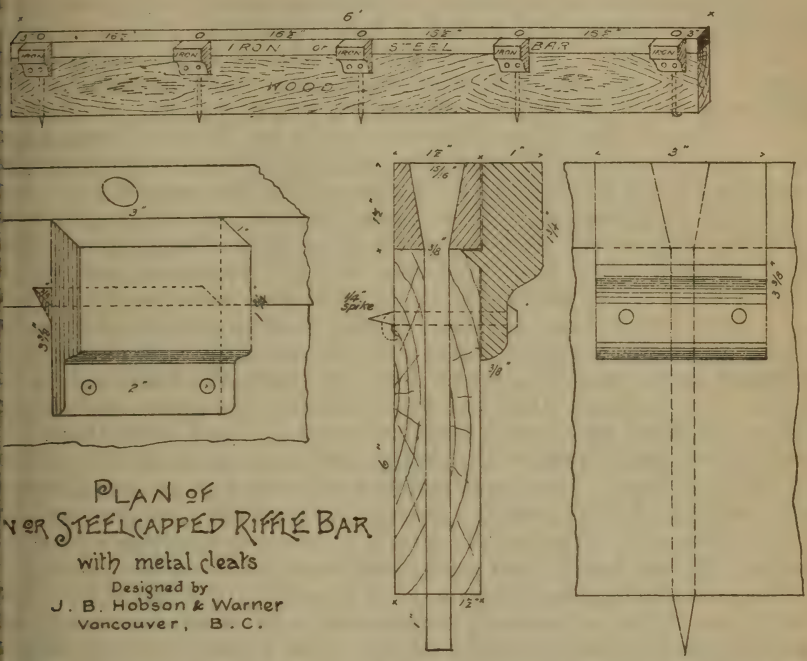
*Keystone Mine* (Hydraulic).—This is situated on the North Fork Trinity River, 10 miles N. of Coleridge, and comprises 320 acres, ly at 2,900′ altitude. A large ditch to convey water from White's Creek under construction; the lumber for the necessary flumes is being m on the ground by a mill with a 60″ saw. It is intended to pipe gravel the whole width of the valley; sufficient dump for that purp can be had in the cañon below. Keystone Mining Co., owner; Geo W. Wilson, of Coleridge, manager.

*Kirby Mine* (Placer).—It lies at the mouth of Emigrant Creek miles S.W. of Denny, at 3,550′ altitude. Water for ground-sluicing obtained from Slide Creek. M. Kirby, of Denny, owner.

*Koon Mine* (Drift).—It is on the South Fork of Trinity River, 8 mi above China Flat, at 940′ altitude. The mine is located on an channel of main Trinity River, filled 60′ deep with gravel, and embr ing 120 acres. For want of water, drifting is resorted to. John Koon, of Burnt Ranch, owner.

*La Grange* (*Ward, Trinity Gold Mining Co.*) *Mine* (Hydraulic).—S our VIIIth, Xth, and XIIth Reports, pp. 638, 702, and 311. T property is located 4 miles W. of Weaverville, at 2,050′ elevation, a contains over 430 acres. Since our last Report double the amount ground has been worked, and a new source of water is being brou from Stewart's Fork, where a first right of 6,000 inches will make t working of the mine practically continuous. This ditch, now unc construction, will be from 12 to 15 miles in length, and requires 8,3 of 6′x7′ tunnel. The entire distance will be flumed with a semi-he agonal flume (the better to hug the hillside), 6′ wide on top, 2′ on botto and 4′ deep, with a 10′ grade per mile. A pressure of 900′ will be ava able, but only about half that amount will be made use of. The p posed tunnel is at an elevation of 3,700′, and will require two years complete, working machine drills from both ends. The present ma ditch is 7′ wide on top, 4½′ on bottom, and 4′ deep, with a 14′ grade p mile. This receives a small feeder carrying 600 inches of water, and 3′ wide on top, 2′ on bottom, and 1′ deep, with a 16′ grade per mi An upper ditch is 7′ wide on top, 4′ on bottom, and 3′ deep, with an to 9′ grade per mile, and a length of 4½ miles. There are 8,500′ of 2 18″, and 15″ pipe. There are 778′ of 4′ flumes, set on an 8″ grad paved partly with 13″ blocks, and partly with rocks. There are al two undercurrents, with three partitions, each lined with blocks a rocks. Five giants with 4″ to 7½″ nozzles, and three derricks with 5 81′, and 90′ booms are used. One of these derricks, built on the Lov

ge pattern, moves rocks weighing 4 tons, placing them with ease in desired place, and making 24 trips per hour. The pits are lighted four arc lights of 2,000 candle-power, furnished by a dynamo of 8½ owatts power, driven by a 3′ Pelton wheel. All parts of the works ditches are connected by telephone, being 20 miles in extent. ty men are employed. A French syndicate, owner; W. H. Radford, Weaverville, superintendent.




*ang's Bar Mine* (Hydraulic).—It is opposite Evan's Bar, 5 miles S. Junction City, at 1,775′ elevation, and contains 100 acres. This is igh bench, with a bank over 100′ high, carrying 3′ to 4′ of gravel t to the bedrock. Water is taken from Dutch Creek through 3½ es of ditch, 4′ wide on bottom and 3′ deep; 3 giants with 6″, 4½″ and nozzles are used, under 200′ pressure. There are 400′ of bedrock and two flumes of 5 boxes each; and a third of 12 boxes, all set on ′ grade, and using pole riffles. Clean-ups are made every three weeks. teen Chinese are employed. Chinese owners.

*ast Chance Mine* (Hydraulic).—It is situated on a former bench of nity River, 4 miles S. of Junction City, at 1,750′ altitude, and con- is 60 acres. Two benches are being worked; the bank is from 10′ to high, with 3′ of gravel, and heavy bowlders on the bedrock; the is soil capping. One half an acre of ground has been worked this son. Water is taken from Soldier Creek and Bell's Gulch, through ile of ditch, 2′ on bottom and 2′ deep, with 18′ grade per mile. The ssure to the first bench is 125′, with 500′ of 7″ pipe; 300 inches of er is used through a No. 1 giant with 3″ nozzle. There are 100′ of rock cut and 6 boxes of 3′ flume set on an 8″ grade; riffles are made 2″x 6″ scantling. The gold is both coarse and fine. About ½ oz. of

platinum was also saved during the season. The clean-ups are m
once a month. The dump into Trinity River is 20′ high. Two
are at work. Joe Ham and F. Marsh, of Junction City, owners.

*Liebrand & Lorenz Mine* (Hydraulic).—See McGillivray.

*Little & Co.'s Mine* (Placer).—It is on French Creek, a tributar
Trinity River, 8 miles N. of Taylor Flat. It is worked by grou
sluicing. —Little et al., of Big Bar, owners.

*Little French Bar Mine* (Drift).—This is an old bar, and lies on Tri
River, 2 miles above Taylor Flat, at 1,360′ elevation. It is being dri
7′ below water-level. A current-wheel furnishes power for a large Chi
pump. Water for the sluices is being taken from the river by w
dam and a ditch ¾ mile long. Spencer & Co., of Big Bar, owners.

*Little Prairie Bar Mine* (Placer).—It is on Trinity River, 5 m
below Big Bar, at 1,380′ altitude. A ditch is under constructio
furnish water for the claim. J. Ziegler, of Big Bar, owner.

*Lone Jack* (*Enterprise*) *Mine* (Quartz).—See our VIIIth, Xth,
XIth Reports, pp. 643, 710, and 482. It is on the East Fork of Tri
River, about a 1 mile S. of Coleridge, at 1,950′ elevation, and with
Enterprise on the opposite side of the river, comprises ten claims.
Lone Jack vein, about 2½′ wide, trends N.E. and S.W., with a
flat dip to the west, between slate and a hornblende rock, carrying
siderable lime. The Enterprise ledge is about 18″ wide, with a
course. On the Lone Jack are four tunnels; the upper one cross-
160′ to the ledge, which it follows 200′ to the N. and 80′ to the S.
other three are driven on the vein; No. 2 is 315′, No. 3, 307′,
No. 4, 200′ long. The corresponding four tunnels on the Enterp
vein are: No. 1, 400′, and the remaining ones 150′, 240′, and 60′ l
The 5-stamp mill, replacing the former arrastra, is supplied with a r
crusher, an ore-feeder, and back and front mortar-plates, and 37
apron- and sluice-plates, set on a 1½″ grade to the foot. The 750
stamps are run at a speed of 90 drops, with 9½″ discharge and 5″ d
crushing 1¾ tons per day to the stamp. The power is derived from
East Fork of Trinity River through ¼ mile of ditch, using 200 inche
water, under 31′ pressure, on a 6′ Pelton wheel. Plates are scra
daily; batteries are cleaned once per month, yielding 80% of the ar
gam. Eight men are employed. — Day, C. Lobdel, and Mrs. J
Balch, of Coleridge, owners.

*Loman & Wyld Mine* (Hydraulic).—See our XIIth Report, p. 312.

*Low Bar Mine* (Hydraulic).—See Jacob Bros.

*Lower Swedes Bar Mine* (Hydraulic).—This is on Trinity River
miles below Taylor Flat, and contains 20 acres, lying at 1,160′ altit
Water is obtained from Pelletrean Creek through a 2′ ditch, 2 m
long, and delivered through 150′ of 10″ pipe to a No. 1 giant, under
pressure. The bank is 40′ high and all gravel. George Bach, of
Bar, owner.

*Lyons & Co.'s* (*Mount Morensis Railroad*) *Mine* (Hydraulic).—
our Xth Report, p. 704. This mine is on Oregon Gulch, 4 miles W
Weaverville, at 2,050′ elevation. It adjoins the La Grange Co.'s grou
and contains 356 acres. The water to work it is obtained from
Cañon and Limekiln Gulch, through a ditch ¾ mile long, 3′ wide
top, 2′ wide on bottom, and 18″ deep, carrying 300 inches of water du
the six months' season. The bank is 30′ high, and the gravel cont
many heavy bowlders, requiring blasting. The gold is coarse, an

nd mostly on the serpentine bedrock. A bedrock flume and 6 boxes, on a 6″ grade, and paved with blocks, are used. One giant with nozzle is used. The dump is into Oregon Gulch. Three men are ployed. The property belongs to the La Grange Co.

*Mahoney & Wallace Mine* (Hydraulic).—See our XIIth Report, p. 2. It is a bar of Cañon Creek, ¾ mile S. of Dedrick, at 1,750′ altitude, and, with adjoining properties, has been bonded to a French ndicate. The 1,500 inches of water is taken from East Fork of Cañon ek through ½ mile of ditch, and delivered through 600′ of 16″ to 11″ e to a No. 1 giant.

*Maple Mine* (Quartz).—See our XIIth Report, p. 312. This mine is miles S.E. of Dedrick, at 2,500′ altitude. Idle. D. L. Smith, of Dedk, owner.

*Martin's Bar Mine* (Hydraulic).—It lies on Trinity River, 1 mile ove Taylor Flat, and embraces 20 acres, lying at 1,360′ altitude. e 2′ ditch takes water from Martin's Creek, 1 mile away. A 7″ hose, 0′ long, with a 2″ nozzle, under 60′ pressure, is used. The sluices are ′ wide, and set on a grade of 8″ per box. The bank is 26′ high and gravel. Larsen & Carlsen, of Big Flat, owners.

*Martin's Flat Mine* (Placer).—It is on Trinity River, 6 miles N. of rnt Ranch, at 760′ altitude. The claim contains 160 acres, and is rked by ground-sluicing. David B. Gray, of Burnt Ranch, owner.

*Mary Blaine Mine* (Quartz).—It is situated on the mountain, 1 mile of New River City, at 6,310′ altitude. The vein, showing 12″ of artz, is 26″ wide, between porphyry walls. Developments consist of 30′ cross-cut tunnel, two drifts on the vein, 40′ and 80′ long, respectly, and a winze 120′ deep on the vein, which dips 75° N. Idle. S. B. ooks, of Cœur, owner.

*Mary Jane Mine* (Quartz).—See our XIIth Report, p. 312. It is 2½ les N. of Dedrick. Ralston & Spencer, of Weaverville, owners.

*Maston Mine* (Hydraulic).—See South Fork.

*McLile Mine* (Placer).—It is on Rattlesnake Creek, 16 miles N. of eridge, and comprises 20 acres, lying at 3,460′ altitude. Water for und-sluicing is taken from Rattlesnake Creek. Theodore McLile, of eridge, owner.

*McGillivray* (*Leibrand & Lorenz, Mammoth*) *Mine* (Hydraulic).—See Xth Report, p. 706. It is on the south bank of Trinity River, 5 es W. of Junction City, at 1,750′ elevation. It is on two of the river nches at Park's Bar. During the past year 2 acres of ground have n worked, with two giants using 5″ nozzles. The outlet is through ng rock-cut and flume, dumping into the Trinity River. Thirteen n are employed. Leibrand & Lorenz, of Junction City, owners.

*McMurray & Hupp Mine* (Hydraulic).—See our VIIIth, Xth, and IIth Reports, pp. 638, 701, and 312. It is on the east side of Weaver ek, ½ mile below Weaverville, at 2,100′ elevation on the bedrock, and tains 96 acres of gravel, 40′ deep; 2½ acres have been worked the t season, with 9 men. McMurray & Hupp, of Weaverville, owners.

*Minersville Mine* (Hydraulic and Drift).—See our XIIth Report, 312. It is 2 miles N. of Minersville, at 2,375′ elevation, and conns 16 acres along the East Fork of Stewart's Fork, at Hayward's Flat, ler which a 250′ drift has been driven. Water is obtained from the ade and Barman ditches, which give 300′ pressure to a giant using a nozzle, through two lines of 11″ and 7″ pipe, 600′ long. The gravel

bank near the rim is about 30′ high; cemented next to the bedr
The present workings are on the east side of the creek, where there
4′ flume of 4 boxes, set on a 6″ grade, and dumping into the East F
Two men are at work. D. Bolton & Son, of Minersville, owners.

*Minersville Hydraulic Gold Mining Co.'s* (*Diener*) *Mine* (Hydraulic
It is N. of Minersville, at 2,300′ elevation, and contains over 2,000 ac
It has lately been acquired by a French syndicate, and most of the w
of the past season was preliminary to getting a working face; 10 a
were cleared of brush and timber, and piped off, the ground be
shallow, with small bodies of gulch gravel in places, carrying co
("pumpkin seed") gold. Many of the bowlders give distinct proo
glacial action. The bedrock, where washed, is partly cement, pa
shale. The company derives its water from the East Fork of Stewa
Fork, through 4 miles of main ditch, carrying 5,000 miner's inches,
20 miles of branch ditches. The dimensions of the main canal are 8′
top, 5′ on bottom, and 3′ deep, with a grade of 26′ per mile; from
main ditch one branch carries 3,000 miner's inches, and the other 2,
miner's inches. The main canal is to be enlarged to a capacity of 7,
miner's inches. The company's entire claims are dominated by
ditch system, which is carried well up to the top of the ridges, givin
pressure of 450′. The company have 4,000′ of 22″ to 18″ pipe-li
Two of the largest-size giants, with 8″ nozzles, are employed.
water season is continuous. There are two strings of flumes, of
boxes each, 8′ wide, with 8″ grade per box; the dump can be direc
either into Digger Creek or through Strope Gulch. Thirty men
employed. A French syndicate, of Minersville, owners; Cte de Ke
lay, of Minersville, president and superintendent.

*Modoc Mine* (Quartz).—It is on Eagle Creek, ½ mile N. of Cœur,
4,450′ altitude. The vein is in the contact between serpentine and
base, and is made up of irregular seams of quartz, 2″ to 6″ thick, i
matrix of decomposed serpentine. The dip is about 45° N.E. A 1-sta
mill and 10 H.P. engine are on the property. G. W. Healey, of Co
owner.

*Mohawk Mine* (Quartz).—It is 1 mile N.W. of Carrville, at 2,600′ a
tude, and consists of three claims, with two veins; one trending N.
and the other E. and W., dipping almost perpendicularly. The pri
pal vein is along the contact of serpentine and porphyry, 2′ wide, with
any sulphurets. A 15′ shaft has been sunk on the vein; a cross-
tunnel has been driven 60′, and requires 20′ more to reach the v
Two men are at work. G. L. Carr, of Carrville, owner.

*Moore Mine* (Placer).—It lies at the mouth of Rattlesnake Creek,
miles N. of Coleridge, at 3,340′ elevation, and contains 40 acres. Wa
for ground-sluicing is taken from Rattlesnake Creek. William Mo
of Coleridge, owner.

*Morrison & Van Sickles Mine* (Drift).—It is ½ mile W. of Minersvi
at 2,300′ elevation at the tunnel's mouth, and contains 40 acres on
old river channel. The 4′ x 7′ tunnel runs W. in gravel on the bedr
veering around to the N. for 270′; a few feet of the bottom of the tun
is in the clay-slaty bedrock, and no breasting has been done yet.
gravel is gray, slightly cemented, and has required no timbering so
The gold is coarse and black, and is found throughout the gravel.
hundred feet above the tunnel on the flat the gravel still crops
Two men are at work. Morrison & Van Sickles, of Minersville, own

*Motolano Mine* (Quartz).—This is a prospect, on Rattlesnake Bar, ween the East and North forks of Trinity River. The vein, from 1′ 4′ wide, trends E. and W., and dips vertically between porphyry and nblende walls. The ground lies very steep, and a short drift has n started. The ore carries copper sulphurets. D. C. Dedrick, of nction City, and C. W. Smith, of Weaverville, owners.

*Mountain View and Mountain Lion Mines* (Quartz).—These are pros-cts, situated about 5 miles N.E. from Lewiston, at about 2,000′ eleva-n, with veins striking N.E. Mrs. Blakemore et al., of Lewiston, ners.

*Nash, Abram & Blythe Mines* (Hydraulic and Drift).—See Trinity ld Placer Syndicate.

*New Hope Mine* (Placer).—It is near the mouth of the East Fork of ffee Creek, 15 miles N.W. from Trinity Center, and contains 20 acres. ork is being conducted on the bed of the East Fork of Coffee Creek h water from this creek. The channel is 30′ wide, the gravel 7′ deep d tight, with many big bowlders. A bedrock cut blasted up the ek is used in place of a flume. A derrick with 26′ boom, run by an rshot wheel 10′ in diameter, is used. Only coarse gold is saved. ur men are at work. J. Benson and G. J. Bowman, of Trinity nter, owners.

*New Moon Mine* (Quartz).—It is on Slide Creek, near Denny, at 00′ altitude. The vein is 12″ thick, and lies nearly level between base walls. The mine is opened by two tunnels, 50′ and 60′ long, pectively. G. B. W. Yocum & Son, of Denny, owners.

*New River District.*—New River empties into Trinity River a few les above Hawkins' Bar. The country through which it runs is tremely rough, rocky, and steep. The mountains are made up of rd metamorphic slates, serpentine, and greenstone. Gold is found paying quantities in all its tributaries. At the heads of Eagle and de creeks a series of quartz veins occur, and a number of locations ve been made on them. There are two camps a mile apart: White ck City, on Eagle Creek, and New River City, or Denny (P. O.), on de Creek. The country rock is a greenish-gray, close-grained diabase, ned on the east by a soft serpentine. The quartz veins are rich, but all, rarely measuring more than a foot in width. Their course is variably N.W. and S.E., and the dip about 45° N.E. Near the sur-ce they lie nearly horizontally. All the mining done in the district s been in this broken part of the veins, the quartz being rich and y to extract. There are a number of stamp mills, both steam and ter power, in the camp. There is another series of fissures, coursing and W., but of later origin than the quartz veins, and filled with citic matter, stained with iron, but barren of gold.

*New York Bar Mine* (Hydraulic).—It is on Trinity River, 8 miles low Taylor Flat, at 1,120′ altitude. The bank is 25′ high and all gravel. Water is conveyed from Halsey Creek through a ditch 3 miles long, th 300′ of 8″ pipe to a No. 1 giant, under 200′ pressure. The sluices e 24″ wide and paved with block riffles. J. Moody, of Big Bar, owner.

*Nicholson Mine* (Placer).—It is on New River, 4 miles below Francis, 1,550′ altitude, and is a new location. A ditch ½ mile long is being g to obtain water from a small creek. T. M. Nicholson, of Francis, ner.

*Ninety-Four Mine* (Placer and Drift).—It is 17 miles N.W. of Trin Center, at 3,675′ elevation, and comprises 20 acres on a high benc Coffee Creek. The gravel channel at this point is 300′ wide, carry heavy, large bowlders, with coarse gold on the bedrock. An 80′ dri being driven. Water for washing purposes is taken from the No Fork of Coffee Creek through 80 rods of ditch, with a grade of ¼″ rod. One man is at work. J. F. Becker, of Trinity Center, owner.

*Nisbrink Mine* (Placer).—It is on Eagle Creek, 5 miles W. of I River City, at 3,200′ altitude, and contains 40 acres. Water for grou sluicing is taken from Eagle Creek. Nisbrink & Apelt, of Cœur, own

*Noble Mine* (Placer).—It lies on New River, 5 miles below Francis 1,420′ altitude. It is worked by ground-sluicing, water being taken f Quinby Creek. Noble Bros., of Francis, owners.

*North Fork Mine* (Hydraulic).—It is on the North Fork of Co Creek and its branches, 13 miles S. from Callahan, Siskiyou County 6,000′ elevation, and consists of 200 acres on the North Fork of Co Creek, 40 acres on Salmon Creek, and 20 acres on Granite Creek. divide, 6,525′ high, separates the North Fork from the main Coffee Cr The North Fork heads in a basin at the head of the gorge of an glacier, along whose east side the remnant of a lateral moraine is v evident. Along the west side the pay-channel has been covered b slide. The top gravel furnished the earlier rich diggings, but bedr was rarely reached; this is the aim of the present company. Gold n gets weighing as high as 8 lbs. have been taken from the top gra The present gravel bank is 20′ deep and carries fine gold, requiring use of quicksilver. Five hundred inches of water are taken from Gra Creek, through a ditch 765 rods long, 3½′ on top and 2½′ on bottom, w a grade ½″ to the rod, and delivered, under 250′ pressure, through of 8″ pipe to a No. 2 giant, using 2½″ and 4″ nozzles. The main N Fork furnishes the bank water. A derrick, with 70′ boom and run 14′ overshot wheel, handles the bowlders. The water season lasts months. The 3′x 3′ flume consists of 60 boxes, set on a 2½″ grade, paved with 8″ wooden blocks. All lumber used has to be whip-sa and costs 5 cents a foot. Fifteen men are employed. North Fork Pl Mining Co. (a corporation), owner; E. G. Rognon, No. 12 Wa National Bank Building, Salt Lake, Utah, secretary; H. V. Carte Callahan, Siskiyou County, superintendent.

*North Star Mine* (Quartz).—See our VIIIth and Xth Reports, 642 and 710. It is on the East Fork of Trinity River, about 6 m N. of North Fork, at 1,950′ elevation. Idle, but preparations are b made to resume. H. Junkans et al., of Weaverville, owners.

*Occidental Mine* (Quartz).—See Bully Choop.

*Ong Dean* (*Dockery*) *Mine* (Placer).—It is in Weaverville, and tains 3 acres. The gravel is from 5′ to 6′ deep in a 14′ bank. The inches of water is taken from Garden Gulch, and used through ca hose with 1″ nozzle. There are 18 flume-boxes lined with iron ri set on 3″ grade. Five Chinese are employed. Ong Dean (Chinese Weaverville, owner.

*Original Bully Choop Mine* (Quartz).—See Bully Choop.

*Oro Grande Mine* (Quartz).—See our XIIth Report, p. 313. It i Hostetter Gulch, 6½ miles N.E. from Trinity Center, at about 3, elevation. Since our last Report a tunnel, 800′ below the upper wo

s been driven to cut the vein. Ten men are employed. Stroude os., of Trinity Center, owners.

*Ozark Mine* (Quartz).—See our XIth Report, p. 482. This is on Rich ulch, 6 miles from North Fork, and contains two full claims. The n, 4″ to 8″ wide, trends E. and W., dips about 25° N., between green- ne walls, and carries high-grade sulphurets and tellurides. The ne has been opened by two tunnels and a shaft, and has a water- ver arrastra. Idle. J. W. Moore, of Coleridge, owner.

*Patterson Mine* (Hydraulic).—See Jacob Bros.

*Paulsen & Hughes Mine* (Hydraulic).—See our XIIth Report, p. 313. is about 3 miles E. of Douglas City, and includes the *Bald Point*, ue *Gulch*, *Gold Dollar*, *Hughes*, *Union Nos. 1 and 2*, and *Vitzthum lch* claims, comprising 575 acres, located in Secs. 32, 33, and 34, T. 32 R. 11 W., at from 2,000′ to 2,600′ elevation. The entire area shows sh gravel of 30′ calculated average depth. The gravel is in part derlaid with cement; the bedrock is serpentine and slate, and there a good dump into the Trinity River. On the Bald Point claim the rim k crops out at 2,050′ elevation, where a tunnel has been driven, show- g the course of the channel to be E. and W. At the supposed center the channel the surface indicates a depth of 200′ of gravel. At the thwest end of the Blue Gulch claim, where the gravel has broken t, a 34′ cut and tunnel have been made. Other cuts have been opened Ritter Gulch, in the S.E. corner, at 2,600′ elevation. The water is rived from Grass Valley Creek; 8 miles of the ditch have been com- ted, and 3 miles more are yet to be dug to bring the water on the ound. This ditch is 4′ on bottom and 2′ deep, with a grade of 16′ per le. Its capacity is 1,500 inches, which can be delivered over the ghest point of gravel with 400′ to 500′ pressure. Two men are pros- ting the ground. Paulsen & Hughes, of Weaverville, owners.

*Phillips Hill Mine* (Hydraulic).—This property is ¼ mile from Lewis- n, on a high bench of Trinity River, at about 2,300′ elevation, and ntains 60 acres. The gravel bank averages 20′ high. About one lf the ground has been worked off. Water is obtained from Dead- od Creek through two ditches, 3 and 5 miles long, respectively. The st is 5′ wide on top and 3′ on bottom with ¾″ grade per rod; the second 8′ on top and 5′ on bottom, with ½″ grade per rod, giving 250′ pres- re through 300′ of 13″ to 11″ pipe to a No. 3 giant with a 5″ nozzle. 900′ bedrock tunnel gives a 100′ dump into Trinity River; the flume 4′ wide and paved with rock. The gold is both coarse and fine. uring the short season of six weeks, 6 men are employed. Phillips Co., of Lewiston, owners.

*Pickett Mine* (Hydraulic).—See Compagnie Française des Placers ydrauliques de Junction City.

*Pony Point Mine* (Drift).—It is situated on Trinity River, 1 mile below ylor Flat, at 1,160′ altitude. The point is a gravel bar containing ny large bowlders. The bedrock lies 10′ below the water-level, and hinese pump, driven by a current-wheel, is used to keep the mine dry. me sluicing is being done on the surface during high water in the er; water for that purpose is brought from Swedes Creek through 3 iles of ditch 2′ wide. John Cooper, of Big Bar, owner.

*Poor Man's Friend Mine* (Quartz).—It is 12 miles W. of Hay Fork, at 100′ elevation, and is a recent discovery on a mammoth ledge, 40′ wide, nning N.E., and dipping S. between slate and porphyry walls. Six

claims are comprised in the property. The quartz is fine-grained n carries a heavy percentage of copper and iron sulphurets. The l is exposed for quite a distance through a slip of one of the walls. quartz is said to assay 148 ozs. silver and from $4 to $6 in gold. men are at work. W. H. Friend et al., of Hay Fork, owners.

*Price Mine* (Hydraulic).—It lies at Cox Bar, on Trinity Rive mile above Big Bar (P.O.). It contains 20 acres, and lies at 1,8 altitude. The channel runs parallel to the river and about 50′ al it. Water is brought from Sawmill Creek through a mile of 3½′ di 300′ of 15″ pipe, and a No. 3 giant, under 80′ pressure, are used. large bowlders are reduced by blasting, and sluiced off. The sluices 3′ wide, set on a grade of 8″ per box, and paved with block riffles. T Price, of Big Bar, owner.

*Quinby Mine* (Placer).—It is on Trinity River, 9 miles above Cl Bar, at 710′ elevation, and contains 40 acres. Water for ground-sluic is taken from Quinby Creek, through a ditch 1 mile long and 2′ w Mrs. Jeanette Ziegler, of Burnt Ranch, owner.

*Rainbow Mining Co.'s Mine* (Placer).—It is situated on a ba Coffee Creek, 12 miles N.W. of Trinity Center, at 3,200′ elevation, contains 160 acres. A pit 10′x 12′x 30′ is being sunk on a bar, about 7′ more will be required to reach bedrock. Gravel and bowl are hoisted up an incline by windlass. The gravel in the upper str is loose, but near the bedrock it is tight, and carries heavy bowlders. 6″ pump, with 3′ stroke, run by a 12′ overshot wheel, taking water fr a neighboring gulch, keeps the pit drained. Wash-water is taken fr Coffee Creek, using 9 sluice-boxes, set on a 1½″ grade, and furnished w slat and auger-hole riffles. All the wood-work is from split lum hand-dressed. Ten men are employed. G. W. Burner et al., of Tri Center, owners.

*Rattlesnake Mine* (Quartz).—It is at the head of Rattlesnake Gu between the East and North forks, about 30 miles N. of North F (P. O.), and contains five full claims. There are two veins, varying fr 6″ to 3′, which course E. and W., and dip 65° N. The ore carries a la percentage of copper pyrites. On No. 1 claim are two tunnels, ab 60′ apart, from 60′ to 70′ in length, and connected by an upraise. S stoping has been done. The mine requires solid timbering. A s discharging, continuous-working arrastra, 9′ in diameter, driven b horizontal water-wheel, and supplied with No. 50 screen, reduces 5 t in twenty-four hours. The water-power can be furnished by either f of the creek, the left-hand fork furnishing 5,000 inches and the oth larger amount, through a ditch 1,500′ long, 6′ on top, 4′ on bottom, w 1½″ grade per rod, and delivered under 100′ pressure. Three men ar work. D. C. Dedrick, of Junction City, and S. Smith, of Weaverv owners.

*Ray Mine* (Quartz).—It is on Donnelly Gulch, 1¼ miles W. of De wood, at 2,400′ elevation. It consists of two claims, one on either s of the gulch. The vein, 10′ wide, strikes E. and W., dips about 60° between slate and porphyritic walls. The quartz is heavily mineraliz On the east side of the gulch two tunnels have been driven, 275′ a 60′ respectively, and one on the west side, all in the vein. Four m are employed. J. Ray, of Deadwood, owner.

*Red Flat Placer Mine* (Drift).—See Dannenbrink.

*Red Hill Mine* (Hydraulic).—See our Xth Report, p. 706. Now known as McGillivray or Leibrand & Lorenz Mine.

*Red Hill Mine* (Hydraulic).—It is 1½ miles W. from Lewiston, and consists of 20 acres on a high bench of Trinity River. The bank is 40′ high, all gravel, and is worked from one pit, using two No. 2 giants with 4″ and 5″ nozzles. Rush Creek furnishes 600 inches of water through 3 miles of ditch, 2′ on bottom and 2′ deep, with ¾″ grade per rod, delivered, at present, under 50′ pressure, through 1,000′ of 18″ to 11″ pipe. The gold is fine, requiring quicksilver in the 200′ of bedrock cut and sluice, which is 480′ long and 3′ wide, set on an 8″ grade, and paved with rock riffles. The dump is into Trinity River. One quarter of an acre of ground has been worked the past season. Six inches of the white bedrock is picked up. Four men are employed. V. M. Chamberlain, of Lewiston, owner.

*Red Hill Mine* (Hydraulic).—It is situated opposite Minersville, on the East Fork of Stewart's Fork, at 2,300′ elevation, and consists of 60 acres on a high bench of the river. The 40′ bank has 15′ of soil and clay capping, which carries a little gold. The channel, of gray gravel, is 125′ wide. A 45′ drift has been run on the bedrock, which gave good "prospects" by panning. The entire ground is heavily timbered. Water will be taken from the Barmen ditch, under 100′ pressure, and there is a 300′ dump into the East Fork of Stewart's Fork. Three men are opening the claim. J. L. McLees et al., of Minersville, owners.

*Reindeer Mine* (Quartz).—It is on Coffee Creek, 5 miles N.W. of Carrville, at 3,000′ elevation. It includes two claims, with a vein trending N.E., and dipping 75° N.W., in porphyritic rock. The quartz is glassy, and carries but few sulphurets. There are two open cuts, 10′x 10′ and 8′x 12′, and a 10′ shaft on the vein. Two men are prospecting. A. Hill, of Carrville, owner.

*Ridgeway Mine* (Quartz).—It lies ½ mile N. of New River City, at 1,850′ altitude. An incline shaft, 200′ deep, was sunk on the vein; later a cross-cut tunnel, about 1,000′ long, was driven. The vein was not cut by it, and the work was discontinued. A 10-stamp steam-power mill, with 850-lb. stamps, belongs to the property, and is connected by tramway with the mouth of the tunnel. The vein is 10″ thick, and both walls are diabase. Ridgeway Gold Mining Co., of Denny, owner.

*Rocky Point Mine* (Quartz).—It is on Eagle Creek, 3 miles N.W. of Cœur. The vein shows 6″ of quartz, and stands vertically. There is a tunnel 60′ long and an incline 30′ deep on the property. Idle. Charles Ellis, of Cœur, owner.

*Salt Lake Mine* (Quartz).—See Smith.

*Sam Lee* (*Harvey*) *Mine* (Hydraulic).—It is 1 mile E. of Weaverville, on the Lewiston road, and contains 30 acres, one half of which has been worked off. The gravel bank varies from 3′ to 20′ in height, and is worked with three giants with 4″ nozzles, under 125′ pressure, two being used for piping and one for washing. The water is obtained from the Crane and Howe ditches, from Little Weaver Creek. The gravel is washed through a rock-cut and 20 boxes of flume, 3′ wide, and set on a 4″ grade. Thirteen Chinese are employed. H. Junkans, of Weaverville, owner.

*Sandy Bar Mine* (Hydraulic).—It lies on Trinity River, 6 miles below Taylor Flat, at 1,140′ elevation. The bank shows 30′ of gravel; the bedrock is 50′ above the river. A ditch, 2′ wide and 1½ miles long,

is being dug to bring water from Vance's Creek. Thomas Wyatt, of ... Bar, owner.

*Scott Mine* (Placer).—It is on New River, 6 miles below Francis ... 1,500′ elevation, and contains 20 acres. Water is brought from Qui ... Creek through a ditch 2′ wide and ½ mile long; 60′ of 7″ hose and ... nozzle, under 25″ pressure, are in use. The sluices are 18″ wide ... paved with block riffles. Scott & Stout, of Francis, owners.

*Self-shooter Mine* (Placer).—It is on Pony Creek, 10 miles ab... Francis, at 2,290′ altitude. The claim is worked by ground-sluici... a "self-shooter" (discharging) reservoir being made use of. Barne... Co., of Francis, owners.

*Sharpar Mine* (Placer).—It is on Trinity River, 8½ miles above Ch... Bar, at 725′ elevation. It contains 80 acres, and is worked by grou... sluicing. John Sharpar, of Burnt Ranch, owner.

*Sheridan Mine* (Hydraulic).—See our XIIth Report, p. 313. It is ... Trinity River, 2 miles S. of Junction City. Since our last Report ½ a... has been worked off on the rim, the outlet being through a bedr... tunnel 500′ long, and continued 300′ for bedrock flume, 3′x 3′, on a... grade. Four men were employed for the three months' season. Sheri... Bros., of Junction City, owners.

*Sherman Mine* (Placer).—It is on Grizzly Creek, 17 miles N. of C... ridge, at 4,000′ elevation. Worked by ground-sluicing. Robert Sh... man, of Coleridge, owner.

*Sherwood Mine* (Quartz).—It is on Eagle Creek, 1 mile N. of Cœur ... 4,450′ elevation. It has been stoped to a depth of about 200′, a... allowed to cave. Lately a 240′ cross-cut tunnel has been run, an... winze sunk 80′ on the pitch of the vein; in the bottom of it the v... shows 4′ of mineralized matter, with a streak of quartz 8″ thick on ... foot-wall and one of 4″ on the hanging-wall. The ore carries a la... amount of pyrites, which are not caved. O. P. Sherwood, of Cœ... owner.

*Shoo-Fly Mine* (Hydraulic).—See Haskins.

*Silver Gray Mine* (Quartz).—See our XIIth Report, p. 313. It is ... miles E. of Dedrick. Only 103 tons stoped and 10′ of tunnel dri... since our last Report. J. M. Thompkins, J. Schock, et al., of Weav... ville, owners.

*Smith Mine* (Quartz).—It is in Sec. 19, T. 36 N., R. 9 W., about ... miles N. of Weaverville, at 4,000′ altitude, and consists of ten clai... There are several veins. The principal one is the *Deer Creek* lode, cou... ing N. and S., with an outcrop about 150′ wide; 600′ farther eas... second parallel vein is 7′ wide. The other claims are known as *S... Creek Nos. 1, 2, and 3*, with veins from 2′ to 4′ wide, striking N. ... The *Gray Mare* lode is 30′ wide, and has a N.W. course; the *Bonan... Stewart's Fork*, and *Dark Horse* lodes have a N.E. trend. No devel... ments of consequence have been made along these veins, which are in ... well-timbered and well-watered country. The country rocks are sla... limestone, and porphyry; some of the veins carry a considerable p... centage of sulphurets. Salt Creek can furnish 100 miner's inches ... water, and Deer Creek 400 inches with ¾ mile of ditch. J. Smith, ... Weaverville, owner.

*Smith Mine* (Quartz).—It is on Rattlesnake Creek, 26 miles N. ... North Fork (P. O.), and embraces two locations on a recently discove... quartz lode. The vein varies from 4″ to 2′. The developments cons...

50′ tunnel on the vein, and several open cuts. An arrastra, to be ven by an overshot water-wheel, is nearly completed. Smith Bros., unction City, owners.

*nyder's Bar Mine* (Drift).—It lies on Trinity River, 4½ miles below ylor Flat, at 1,150′ altitude. Worked by drifting in the bank of the r above water-level. Rhodes & Palmer, of Big Bar, owners.

*ouden Mine* (Hydraulic).—It is 1½ miles W. of Weaverville, and tains 8 acres of gravel, worked with one giant by a Chinese company, h water from West Weaver Creek.

*outh Fork (Maston) Mine* (Hydraulic).—See our XIIth Report, p. . It is between the forks of Trinity River, 6 miles above China Flat, 360′ elevation, and comprises 1,800 acres. The long and expensive h not being completed, drifting is resorted to. The channel is 800′ e on slate bedrock, and the gravel is 20′ to 30′ deep, and somewhat mented. South Fork Mining Co., owner; Peter Hammer, of China t, Humboldt County, manager.

*tetson Mine* (Hydraulic).—It is on Trinity River, 8 miles below ylor Flat, at 1,140′ elevation. A No. 2 giant, under 200′ pressure, l 400′ of 9″ pipe, are in use. Water is brought from Halsey Creek by ′ ditch 1½ miles long, and the bank is 30′ high. Stetson & Co., of Big r, owners.

*tevens Mine* (Placer).—It is on the North Fork of New River, 4 miles ve Francis, at 1,960′ elevation. Water for ground-sluicing is taken m a small gulch through a 2′ ditch ½ mile long. F. P. Stevens, of ur, owner.

*tewart's Fork Mine* (Quartz).—See Smith.

*ulphur Spring Mine* (Hydraulic).—It is 1½ miles W. of Lewiston, and oins the Red Hill Mine. It is leased to and worked by Chinese, who one giant, with water at night, from the claim above, paying $150 season. The gravel next the bedrock is strongly cemented; the bed-ck has not been reached yet. Eleven boxes 40″ wide, set on 3¼″ grade, used. Five Chinese are working. V. M. Chamberlain, of Lewiston, ner.

*wift & Co.'s Mine* (Hydraulic).—See our XIIth Report, p. 313. This 4 miles N.E. of Douglas City, and contains 80 acres. Since our last port ¾ acre of ground has been worked by 3 men. — Swift et al., of uglas City, owners.

*aylor Flat Mine* (Hydraulic).—It is on Trinity River, 10 miles below Bar, at 1,290′ elevation, and contains 147 acres. The mine is an umulation of gravel 35′ high, in a bend of the river, lying 10′ to 15′ ve low-water mark. A ditch 6′ wide and 4½ miles long, with a grade 10′ per mile, conveys water from French Creek to the mine. There 3,000′ of 15″ pipe and two No. 5 giants, under 300′ pressure. The lices are 4′ wide, with block riffles, and set on a 3″ grade. The ght grade in the sluices necessitates the removal of stones by a der-k, and is causing a heavy and unnecessary expense, as a good dump l ample grade may be had. Idle. Griffith, Perkins & Co., of Big r, owners.

*Thomas Mine* (Placer).—It is on New River, 6 miles below Francis, 1,510′ elevation, and contains 80 acres. Worked by ground-sluicing, h water brought from Quinby Creek through a 3′ ditch 1½ miles long. e bank is 16′ high and all gravel. R. L. Thomas, of Francis, owner.

*Tinsley Mine* (Drift).—It lies on Trinity River, 1 mile above Big at 1,350′ elevation. It is worked by drifting in the bank of the r C. W. Tinsley, of Big Bar, owner.

*Toronto Mine* (Quartz).—It is 1½ miles N.W. from Deadwood, at 1 elevation. There are several veins on the property trending E. and and dipping N. and S., between slate and porphyry. The large these is 3′ wide. Several tunnels have been run, the longest giving of backs. Two of the tunnels are cross-cuts, 70′ and 80′ long, and others are short drifts on the vein. Some of these veins carry a h percentage of iron and arsenical sulphurets. One man is at work. Murphy, of Deadwood, owner.

*Toughnut Mine* (Quartz).—It is on New River, near Denny, at 4, altitude. The developments consist of four tunnels, 100′ to 200′ l run on the cropping of the vein, about 100′ apart. The vein aver 8″ in width, courses N.W. and S.E., and dips 45° E. Both walls diabase. T. J. Ladd et al., of Denny, owners.

*Trinity River* from North Fork (village) to the mouth of the S Fork, on the line of Humboldt County, runs through a cañon. hills on both sides are steep and rocky, and recede only here there far enough from the river to allow gravel bars to form. Part former channels, always rich in gold, are found on the hillsides m hundred feet above the present river. Water for piping can gener be had at small expense. From Cedar Flat to the mouth of New R the Trinity runs through a box cañon 2,000′ deep, and inaccessibl the miner. Below New River the valley widens, and vast accum tions of rich gravel are found. Several old channels, one above other, may be traced along the hillsides. To work these deposits w must be brought a distance of 15 to 20 miles, and the great expense so far prevented the gravel from being worked.

*Trinity Gold Placer Syndicate's (Ltd.)* (*Nash, Abram & Blythe*) M (Hydraulic and Drift).—See our Xth Report, pp. 697 and 698. T property is at the headwaters of Coffee Creek, and extends for a c tinuous distance of 7 miles along the creek. The main works are miles N.W. of Trinity Center, and can be reached by trail only; t are chiefly on the old Nash & Abram ground; the whole embraces area of 4,000 acres, at about 5,000′ elevation. The ground to be wor is partly covered with glacial debris, but embraces also the pres creek-bed and high benches of the same. The conformation of ground at the head of the creek indicates that the present drainag Salmon River formerly took its course through Coffee Creek, as a nar barrier at present cuts off and deflects Salmon River. The grade fr the Big Gravel Flat, one of the sources of Coffee Creek, down to present workings on the Nash property, a distance of 6 miles, give fall of about 650′, or a 2% grade; beyond this the grade is much ligh The gold in the upper reaches of Coffee Creek, as far down as the for Abram property, is similar in character and value ($17 50) to Salmon River gold. Below, on the Nash property, the gold ha higher value. To decide the existence of a supposed back channel company drifted 200′ in the southeast bank, without obtaining results. A cut 5,000′ long is being brought up the creek at Abra Flat to drain the same, in an attempt to reach bedrock; the present f of the cut is 12′ in gravel. A portion of this section of the property leased, and is being drifted with favorable results. During the p

on some drifting was done on the Nash portion of the property. ow the main work on the Nash ground considerable grade is gained unneling a spur of the ridge that has diverted the straight course of channel. About 1½ miles from the main works the company has a mill, with a capacity of 15 M. per day. The formation is partly itic and partly serpentinoid, showing former continuous glacial on. The South Fork of Coffee Creek affords 3,000 inches of water. ough a ditch 4′ on top and 2½′ on bottom, with ¼″ grade per rod, iteen men are employed. An English syndicate, owner; W. Maitland, Abrams, manager.

*Trinity River Hydraulic Mining Co.'s Mine* (Hydraulic).—See our lth Report, p. 314. It is situated 3½ miles N.W. from Douglas City, l contains 360 acres on a high bench of Trinity River. Since our last port the former pits have been partially abandoned and a new cut has n started from old Turner Bar, requiring 40 rods of new ditch. Six n are employed. A. S. Dunbar, of Douglas City, superintendent.

*Uncle Sam Mine* (Quartz).—It lies on Eagle Creek, ½ mile N. of Cœur, 1,500′ elevation. There are three short tunnels and a 200′ shaft on the lim. The vein is 8″ thick and stands vertically, between diabase ls. A 5-stamp steam-power mill, with 300-lb. stamps, belongs to the perty. James Cullich, of Cœur, owner.

*Underground Treasure Mine* (Placer).—It is on the East Fork of ffee Creek, about 3 miles above its mouth, at 4,750′ elevation, and 21 es from Trinity Center. The property contains eight claims, or 160 es, on the channel of the East Fork. The bank is about 40′ high and channel about 30′ wide, half the width being worked at a time with elf-shooting reservoir, which empties in about five minutes through a ′x 16″ culvert. It takes forty minutes to fill the reservoir during the t part of the water season; later it requires two hours to fill. The ter used is from the East Fork of Coffee Creek. The large bowlders handled with a derrick. Instead of a flume, a big bedrock cut is d, saving the coarse gold only. The gravel is loose and of a gray or. Three men are employed. P. Holland, of Trinity Center, owner.

*Union Hill Mine* (Hydraulic).—It is in Sec. 6, T. 32 N., R. 9 W., mile E. of Douglas City, between Weaver Creek and Trinity River, and tains 300 acres. The works have been shut down through a slide ing all their tunnel and cuts, and the ground cannot be reopened hout driving a new tunnel from the Trinity River side. The former nel, carrying the flume, was 800′ long, and on a 4″ grade. From to 15 acres have slid out and filled the cuts. The former pits had nks 94′ high, with 2′ to 14′ of gravel, and the remainder loose soil-coping, which, when saturated with water, flows like mud; this cap-ng carries gold throughout. Water is brought from Weaver Creek rough 9 miles of ditch, with a very light grade. By continuing the Cass Valley ditch, water under a good head can be procured. A good mp into the Trinity River may be obtained by driving a short tunnel. e ground contains very few bowlders. Mason & Fair, of Douglas ity, owners.

*Upper Swedes Bar Mine* (Drift).—It is on Trinity River, 1 mile below ylor Flat, at 1,150′ elevation. Worked by drifting in the bank of the rer, above the water-level. Charles Kinterman, of Big Bar, owner.

*Vance's Bar Mine* (Drift).—It is on Trinity River, at Big Bar (P. O.), 1,320′ elevation. The claim is worked by drifting in the bank of the

river. Water is obtained from Deer Creek, and piped across the ri on a suspension bridge 300′ long. Harrington & Wallace, of Big 1 owners.

*Van Winkle Mine* (Drift).—It lies on Trinity River, 5 miles below Bar, at 1,380′ elevation. The drifts are under the bank, 9′ below wa level. Water to drive an overshot pump-wheel and to fill the sluice taken from Little French Creek. Elias Van Winkle, of Big Bar, ow

*Vitzthum Gulch Mine* (Hydraulic).—See Paulsen & Hughes.

*Ward Mine* (Hydraulic).—See La Grange.

*Waters Mine* (Placer).—It is on the North Fork of Trinity Rive miles N. of Coleridge, at 2,520′ elevation. Worked by ground-sluici William Waters, of Coleridge, owner.

*Watson's Bar Mine* (Hydraulic).—It is on Trinity River, 2 miles be Taylor Flat, at 1,180′ altitude, and contains 28 acres. Water is tal from Swedes Creek and conveyed across the river through a 7″ can hose, 300′ long, suspended on a wire rope, which is inside the hose. 2′ nozzle works under a 100′ pressure. The bank is 30′ high and gravel, and the sluices are 24″ wide. Pelletrean & Co., of Big B owners.

*Webber Mine* (Placer).—It lies on the East Fork of New River, 8 mi above Francis, at 2,120′ elevation. Worked by ground-sluicing. Web & Niles, of Francis, owners.

*White's Bar Mine* (Drift).—It is on Trinity River, 1½ miles below Bar (P. O.), at 1,310′ elevation, and contains 20 acres. The claim on a bar near the river, which is being drifted 15′ below the river wat level. The mine is cleared of water by a large Chinese pump, driven an overshot water-wheel 15′ in diameter and 3′ wide. Water for po and sluices is taken from the river by a wing-dam and ditch. J. Philbrooke, of Big Bar, owner.

*Wilshire Mine* (Hydraulic).—It is on Trinity River, at Big Bar, 1,355′ elevation. Water is taken from Sawmill Creek through a 3′x ditch 2 miles long, and delivered through 1,000′ of 15″ pipe to a No giant, under 60′ pressure. The sluices are 24″ wide, and set on an grade. A vein of coal crops out on this claim. Stewart Gibson, Weaverville, owner.

*Yellowstone Mine* (Quartz).—See our Xth and XIIth Reports, pp. 7 and 314. It is at Coleridge, on the East Fork of Trinity River, a constitutes part of the property of the Niagara Company, in Sha County. It is being worked on a lease by 2 men, who are driving ahe on the vein. Niagara Mining Co., of French Gulch, Shasta Coun owner.

## MILLS IN TRINITY COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Bartred | Steam | 10 | 850 | 15 | | | | | | |
| Bonanza King | S. & W. | 5 | 800 | | | | | | | |
| Boomer | Water | 3 | 450 | | | | | | | |
| Brizard | Water | 2 | 400 | | | | | | | |
| Brown Bear | Steam | 15 | 750 | 25 | 4 | Frue | | | | |
| Excelsior | Water | 6 | 450 | | | | | | | |
| Fountain Head and Thanksgiving | Steam | 5 | 650 | 6¼ | 4 | Frue | | | | |
| Golden Chest | Water | 5 | 750 | 6¼ | 4 | Frue & Triumph | | | | |
| Lone Jack and Enterprise | Water | 5 | 750 | 8½ | | | | | | |
| Modoc | Steam | 1 | 650 | | | | | | | |
| North Star | Water | 10 | 900 | 15 | 1 | Frue | | | | |
| Occidental and Bully Choop* | Steam | 3 | 850 | 6 | 1 | Triumph | | | | |
| Oro Grande | Water | 5 | 750 | 7½ | | | | | | |
| Ridgeway | Steam | 10 | 750 | | | | | | | |
| Uncle Sam | Steam | 5 | 300 | | | | | | | |
| Yellowstone | Water | 10 | 850 | 7½ | | | | | | |

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list :

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN TRINITY COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Alaska | Water | 1 | Arrastra | 13′ | 4 | | | | | | |
| Amy Balch | Water | 1 | Arrastra | 9′ | 2 | | | | | | |
| Buck's Ranch | Water | 2 | Huntington | 3½′ & 5′ | | | | | | | |
| Chloride | Water | 1 | Huntington | 3½′ | 6 | | | | | | |
| Excelsior | Horse | 1 | Circ'lar Roller | | 1 | | | | | | |
| Forget-Me-Not | Water | 1 | Arrastra | 9′ | 2 | | | | | | |
| Frick & Davis | Water | 1 | Arrastra | | 1 | | | | | | |
| Globe | Steam | 1 | Huntington | 3½′ | 5 | | | | | | |
| Himes | Water | 1 | Arrastra | 10′ | 2 | | | | | | |
| Maple | Water | 1 | Arrastra | 10′ | 4 | | | | | | |
| Occidental and Bully Choop | Steam | 1 | Arrastra | 8½′ | | | | | | | |
| Ozark | Water | 1 | Arrastra | | 4 | | | | | | |
| Rattlesnake | Water | 1 | Arrastra | 9′ | 5 | | | | | | |
| Silver Gray | Water | 1 | Huntington | 5′ | 10 | | | | | | |
| Smith | Water | 1 | Arrastra | | | | | | | | |
| Vermont | Steam | 1 | Cannon Ball | | 3 | | | | | | |

## Tulare County.

*Adams Flat Mine* (Placer).—See our XIIth Report, p. 295. It is 5 miles S. of Auckland. A. B. Brown and B. Willis, of Auckland, owners.

*Agnes Fletcher Mine* (Quartz).—It is in Yokohl Valley, 1 mile E. of Yokohl. An open cut 6′ deep discloses a quartz vein 30″ wide, dipping E. A prospect shaft is being sunk. C. T. Lindsey, of Visalia, owner.

*Ante-Up Mine* (Quartz).—See our XIIth Report, p. 295. Idle. Charles Ivby, of White River, owner.

*Bald Mountain Mine* (Quartz).—See our XIIth Report, p. 295. It is -miles S.E. of White River, at 2,200′ altitude. The 4′ to 7′ wide vein curs in granite, and has 4″ to 12″ of pay-ore. The vein courses N. l S., and dips nearly vertically. The older extensive workings are ed. A new shaft, 75′ deep, has been sunk, and drifts run 135′ W. l 50′ E. A small steam hoist is used. An old (built in 1866) tamp steam-power mill belongs to the property. Nelson Hallock, of hite River, owner.

*Barton Mine* (Quartz).—See our XIIth Report, p. 295. It is on Rattlesnake Creek, 2½ miles N. of Auckland, at 1,600′ elevation. The vein s′ thick and consists of a mineralized zone, with free gold in a decomposed granite rock. Some 20′ below the vein lies a bed of hard, bluish conglomerate, 250′ to 300′ thick. The pebbles are mostly silicious, water-worn, and flattish, and are cemented together with silicious material. A winze, 100′ deep, has been sunk from the 350′ tunnel, and from which they are stoping. A 3½′ Huntington mill, driven by a 16 H.P. engine, belongs to the property. H. D. Barton, of Auckland, owner.

*Billy Brown Mine* (Quartz).—It is in Frazer Valley, 8 miles N.E. of Porterville. The development consists of an incline shaft, 100′ deep, and four tunnels, 20′, 26′, 90′, and 110′ long, all on the vein, which is 8″ thick, lies in granite, and dips 70° E. The ore is free-milling, and is worked in a horse-power arrastra. Hocket Bros., of Porterville, owners.

*Black Prince Mine* (Quartz).—See under head of Silver.

*Bluebird Mine* (Quartz).—See under head of Silver.

*Blue Mountain Mine* (Quartz).—See our XIIth Report, p. 296. It is on the western slope of Blue Mountain, in White River District. McDonald, of White River, owner.

*Bob Allen* (*General Grant*) *Mine* (Quartz).—It is on Slate Mountain, miles S.W. of White River, at 1,420′ elevation. The 18″ vein lies in lite, and dips 60° N. There are two shafts, 24′ and 31′ deep, and a unnel 80′ long on the vein. P. C. Montgomery, of Porterville, owner.

*Clara Gibbons Mine* (Quartz).—See our XIIth Report, p. 296. It is on Chileno Gulch, 3 miles S.E. of White River, at 1,610′ altitude. The developments consist of a 90′ incline shaft on the vein and a cross-cut tunnel 125′ long, with a drift near the end 100′ long, connecting with the bottom of the shaft. The 6″ vein courses in granite, and dips 45° E. C. H. Gibbons et al., of White River, owners.

*Coarse Gold Mine* (Quartz).—It is ½ mile S. of White River, at 1,240′ altitude. There is a shaft 55′ deep, with drifts 40′ and 50′ long, on the claim. The vein is 4″ wide, and dips 85° S., between granite foot-wall and diabase hanging-wall. J. O. Culver, of White River, owner.

*Diamond Mine* (Quartz).—It is ¼ mile S. of White River, at 1 elevation. The vein is 3′ wide, with 10″ of quartz, and stands verti between granite walls. Developments consist of a shaft 42′ deep 35′ of drifts. Nelson Hallock, of White River, owner.

*Domingo Mine* (Quartz).—See under head of Silver.

*Eclipse No. 2 Mine* (Quartz).—See our XIIth Report, p. 296. It miles S.W. of White River, at 1,200′ altitude. The vein is 2′ wide, 6″ to 12″ of quartz, and dips 85° N. The older workings are stoped and abandoned. The new tunnel is 304′ long and has a 218′ winze the end, with short drifts near the bottom. Nelson Hallock, of W River, owner.

*Ely Mine* (Quartz).—See Oliver Twist.

*Enterprise Mine* (Quartz).—It is on Slate Mountain, 5 miles S.W White River, at 1,380′ altitude. There is a 100′ tunnel and a 50′ s on a 6″ vein of quartz, dipping 80° N.W. The walls are micac schist. J. A. G. Smith, of White River, owner.

*Eschscholtzia Mine* (Quartz).—See our XIIth Report, p. 296. It Bear Mountain, 5 miles E. of Auckland, at 2,600′ elevation. The is 10″ wide, and dips 45° W., between granite walls. Two tunnels and 70′ long, cut the vein. O. Barton, of Auckland, owner.

*General Grant Mine* (Quartz).—See Bob Allen.

*Good-Enough Mine* (Quartz).—See our XIIth Report, p. 296. It Chileno Gulch, 3 miles N.E. of White River, at 1,360′ elevation. A 50′ shaft has been sunk. The vein is 6″ thick, and stands verti between granite walls. Owen Peters, of White River, owner.

*Gray Eagle Mine.*—See under head of Silver.

*Hardtack Mine* (Quartz).—See our XIIth Report, p. 296. Nor Brown, of White River, owner.

*Hard Times Mine* (Quartz).—See our XIIth Report, p. 296. It i Chileno Gulch, 3 miles N.E. of White River, at 1,310′ altitude. J. Jacombs, of White River, owner.

*Harvest Home Mine* (Quartz).—See our XIIth Report, p. 296. Wilbern, of White River, owner.

*Homestake Mine* (Quartz).—See our XIIth Report, p. 297. It miles S.W. of White River, at 1,200′ elevation. Idle. D. W. Grove Santa Cruz, Santa Cruz County, owner.

*Isian Peak Mine* (Quartz).—See our XIIth Report, p. 297. G. Dove White River, owner.

*Keys Mine* (Quartz).—See our XIIth Report, p. 297. It lies ¼ m S.E. of White River, at 1,200′ altitude. Idle. H. A. Harris et al White River, owners.

*Last Chance* (*Redfield*) *Mine* (Quartz).—See our XIIth Report, p. It is 2 miles W. of White River, at 1,100′ altitude. Idle. Nelson H lock, of White River, owner.

*Lucky Cuss Mine* (Quartz).—See our XIIth Report, p. 297. B. Al of White River, owner.

*Mammoth Mine* (Quartz).—It is 1½ miles S.W. of White River, at 1, altitude. The vein is 3″ to 8″ thick, and occurs in granite. There tunnel on the vein 350′ long and a shaft 90′ deep. Idle. G. W. Gro of Santa Cruz, Santa Cruz County, owner.

*Mammoth Mine* (Quartz).—See our XIIth Report, p. 297. It i the Middle Fork of Tule River, 20 miles N.E. of Milo, at 6,300′ elevati Idle. J. Goldstein et al., of Visalia, owners.

*Mineral King Mines.*—See under head of Silver.

*Monarch Mine* (Quartz).—It adjoins the Mammoth, and is on the same vein. Idle. J. Goldstein et al., of Visalia, owners.

*Oliver Twist* (*Ely*) *Mine* (Quartz).—See our XIIth Report, p. 296. It is 1 mile N.E. of White River, at 1,260′ elevation. Idle. O. N. Peters, of White River, owner.

*Otter Mine* (Quartz).—See our XIIth Report, p. 297. It is in Coarse Gold Gulch, 1¼ miles S. of White River, at 1,420′ elevation. Idle. J. Beaver, of White River, owner.

*Page Mine* (Quartz).—See under head of Copper.

*Pincher & Bulger Mine* (Quartz).—See our XIIth Report, p. 297. It is on Lime Creek, 23 miles E. of Visalia. Idle. J. Edwards, of Visalia, owner.

*Redfield Mine* (Quartz).—See Last Chance.

*Richelieu Mine* (Quartz).—See our XIIth Report, p. 297. It is 1½ miles S.E. of White River, at 2,250′ elevation. The vein is in granite, is 4′ wide with 4″ to 24″ of quartz, and dips 75° N. The developments consist of a shaft 180′ deep, with drifts 165′ E. and 78′ W., and a cross-cut tunnel 155′ long. An 8 H.P. steam hoist, using ⅝″ rope and 10″x 40″ drum, stands above the shaft. Idle. Nelson Hallock, of White River, owner.

*Royal Mine* (Quartz).—It is on Slate Mountain, 5 miles S.W. of White River, at 1,400′ altitude. The vein occurs in mica-schist, dips N., and is 8″ wide. There is a shaft on the claim 90′ deep. Richard Roberts, of White River, owner.

*Sarah Tucker Mine* (Quartz).—See our XIIth Report, p. 297. C. Briggs, of White River, owner.

*Simmons Mine* (Quartz).—See our XIIth Report, p. 297. It is on Slate Mountain, 2 miles E. of White River, at 2,200′ elevation. The developments consist of a shaft 50′ deep, a 50′ drift at the bottom, and a 30′ winze. The vein is 4″ to 6″ wide, dips 80° N., and has granite walls. J. E. Dunlap, of White River, owner.

*Stencil Mine* (Quartz).—See our XIIth Report, p. 298. It is 1½ miles S. of White River, at 1,150′ elevation. A new 50′ shaft, with a 25′ drift to the E., has been made, and also a tunnel 30′ along the vein, with a winze 15′ deep. The vein averages 8″, and occurs in granite. John O'Laugher, of White River, owner.

*Sunset Mine* (Quartz).—See our XIIth Report, p. 298. T. J. Maxwell, of White River, owner.

*Sulture Mine* (Quartz).—See our XIIth Report, p. 298. A. R. Sorrells, of White River, owner.

*Way Up Mine* (Placer).—See our XIIth Report, p. 298. It lies 20 miles N.E. of Camp Badger, and is worked by ground-sluicing. E. S. Adam, of Camp Badger, owner.

MILLS IN TULARE COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. |
|---|---|---|---|---|
| Slate Mountain | Steam | 5 | 650 | 6 |
| Woodstake | Steam | 5 | 650 | 6 |

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN TULARE COU

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Cap per 24 in T |
|---|---|---|---|---|---|
| Barton | Steam | 1 | Huntington | 3½′ | |
| Billy Brown | Horse | | Arrastra | | |

## Tuolumne County.

The impression which seemed to prevail that Tuolumne County a "pocket" mining region with no mines of a permanent character, been completely dispelled by the developments of the past two y All along the gold belt many old mines have been reopened, and result of extensive developments confirms the existence of mines w give every promise of permanence and value. The new villag Quartz Mountain and Stent (Poverty Hill) have sprung into exist and are the direct result of the opening of valuable mines. Still fa south, at Jacksonville, the old town has been almost entirely reb and extensive operations are in progress along the Mother Lode, w two years and more ago all was dormant. There is also a reviv interest along the East Lode; the old mines are being reopened at n points, and among them many are of the most encouraging chara The changed conditions, due to cheaper labor and supplies, impr facilities and methods, are all producing a change for the better in county. Meanwhile the "pocket" mines have been pouring out a st golden stream, this branch of the industry being accelerated by general revival of interest in mining. The installation of at least electric plants, one by the Santa Ysabel Mining Co., at Quartz M tain, and the other near Columbia, on the Stanislaus River, by Columbia Marble Co., and their successful operation, will no doubt to further investments in that direction.

*Ah Mow* (*White Lead*) *Mine* (Placer).—See our XIth and X Reports, pp. 507 and 298. It is about ½ mile N.W. of Columbia. mine has been worked steadily during the past five years by Chi The gold-bearing gravel and debris are handled by means of a de operated by a gasoline-engine. Twelve Chinese are employed. Ah et al., of Columbia, owners.

*Ajax Mine* (Quartz).—It is on the Majors ranch, near Roche Ca Joseph Majors & Co., of Sonora, owners.

*Alabama Mine* (Quartz).—See our Xth and XIIth Reports, pp. 741, and 298. It is 2 miles N.W. of Quartz Mountain, and is the claim south of Table Mountain. In former years a large open cut made on the vein, and a cross-cut tunnel, 200′ in length, run from surface to the bottom of the cut. The mine has recently been reope the cut cleared out and a shaft started in the bottom, the gallows-fr being built in the cut. The rock raised through the shaft will be in cars through the tunnel. Two drifts have been run in a south direction on the vein, and other work inaugurated. Sixteen men employed. Alabama Gold Mining Syndicate, of San Francisco, ow W. E. Nevills, of Jamestown, superintendent.

*Alameda Mine* (Quartz).—See our Xth and XIth Reports, pp. 55 and 8. It is ½ mile N. of the Rawhide Mine, and has two tunnels, 250′ 427′ long, respectively; the latter connecting with a shaft 200′ deep. re are also numerous drifts, open cuts, and shallow shafts along the pings. A drift, 200′ long, in the fall of 1895, was run along the vein the bottom of the shaft. M. B. Harriman, of Sonora, owner.

*Alexander Mine* (Quartz).—It is on Cobbs' Gulch, 1¼ miles S. of Priests. as been worked for pockets. Con. Alexander, of Big Oak Flat, er.

*Alhambra Mine* (Quartz).—It is a prospect, 1 mile W. of Tuttletown. Rikert, of Sonora, owner.

*Allen Mine* (Quartz).—It is a prospect, ¾ of a mile N.W. of Jamestown. ard Preston, of Jamestown, owner.

*Alta and Antelope Mines* (Quartz).—See our Xth Report, p. 757. They 22 miles N.E. of Groveland, in Santa Maria District. Alta Mining of Sonora, owner.

*Alvarado Mine* (Quartz).—It is 12 miles S.E. of Sonora, and adjoins Buchanan on the south, forming a portion of the Chaparral prop- Fred Wenzel, of Sonora, owner.

*Anti-Chinese Mine* (Quartz).—It is ¼ mile W. of Tuttletown. It has ′ shaft on a 6′ vein. William Pererra, of Sonora, owner.

*App & Heslep Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 661, and 299. It is on Quartz Mountain, at 1,500′ elevation. After a idleness, the mine was reopened in 1893, the old 800′ shaft cleaned etc. It was then decided to sink a new shaft, which is now 800′ deep. work in this shaft was carried on from the surface and 800′ level ultaneously. The connection was made nearly midway between e points, and was a very creditable piece of engineering. Levels have opened on a large quartz vein which lies near the foot-wall side of great ankerite and mariposite mass, which is such a prominent ire of Quartz Mountain. The surface plant consists of a powerful ple-geared water-power hoist and a new 20-stamp water-power mill 0 tons daily capacity. Sixty-four men are employed. App & Hes- Mining Co., of San Francisco, owner; William Moorehead, of Quartz ntain, superintendent.

*Aramenta Mine* (Quartz).—It is 13 miles S.E. of Sonora. See Garfield- inia.

*Arbona Mine* (Quartz).—It is in the southern outskirts of Tuttletown. vein, from 4′ to 8′ wide, of solid quartz, contains a small percentage on sulphurets. P. Keeffe, of Sonora, owner.

*Argall Mines* (Quartz).—This group consists of the *Elgin*, *Eunice*, *Aldis*, *McCure*, *Miranda*, and *Virginia* claims, on Big Creek, 6 miles of Groveland. The principal development is on the Elgin, where ′ shaft has been sunk and 100 tons of quartz extracted. Henry ll, of Groveland, owner.

*Argentum Mine* (Quartz.)—See our XIIth Report, p. 299. It is situ- in American Camp District, 10 miles N.E. of Columbia. J. B. nall, of Columbia, owner.

*Atlas Mine* (Quartz).—It is on Jackass Hill. The vein, a silicified ase, strikes N. 65° W; it contains 10% or more of auriferous te. Old surface excavations extend along the vein for 1,000′ or e. The principal developments consist of an open cut 50′ deep, 60′ , and from 20′ to 30′ wide, at the bottom of which a 125′ inclined

shaft has been sunk. A tunnel, 200′ long, connects with the bottor the open cut. Idle. Joseph Podesto, of Tuttletown, owner.

*Badger Mine* (Quartz).—See our XIth Report, p. 508. It is 3½ n S.W. from Tuttletown. Some prospecting was done in 1895. — mer, of Gilroy, owner.

*Bald Mountain* (*Austrian*) *Mine* (Quartz).—It is on Bald Mount ½ mile N.E. of Sonora. Birney & Hudson, of Sonora, owners.

*Basin Mine* (Quartz).—It is on the North Fork of the Tuolu River. The vein is reported to be 1′ to 3′ wide. It is equipped wit 5-stamp steam-power mill. John Rocco, of Sonora, owner.

*Beckwith & Saunders Mines* (Quartz).—They are situated in 36, T. 2 N., R. 12 E., 2 miles W. of Tuttletown. Several veins of g bearing quartz are known to cross the property in a N.W. direct Some superficial development has been made, and pocket-hunting car on to a considerable extent. Beckwith & Saunders, of Tuttletc owners.

*Belcher Consolidated Mine* (Quartz).—See our VIIIth Report, p. It is 1½ miles N.W. of Groveland. Idle for several years.

*Belle Mine* (Quartz).—It is 1 mile N.W. of Tuttletown. It has a cross-cut tunnel and drifts 30′ N. and S. on the vein. Fred Suttor Sonora, owner.

*Bellevue* (*Hyde, Golden Treasure*) *Mine* (Quartz).—See our VII Xth, XIth, and XIIth Reports, pp. 670, 755, 501, and 299. It is 6 m N.E. of Sonora, on land covered by an agricultural patent. The system occurs in grano-diorite. The incline shaft is 575′ deep. In fall of 1895 a large vein was discovered in the lower levels which is to be better grade than anything previously opened in the mine. vein is 12′ to 14′ wide and has a banded structure near the walls, bu massive in the center. The quartz throughout the mine contains a low percentage of sulphurets, unusual for veins in granite in this cou The mine is equipped with steam hoist and mill. A free water-po could easily be made available, but has been neglected. Sixteen are employed. Bellevue Mining and Agricultural Co., of San Franci owner; A. McDonald, of Sonora, superintendent.

*Benjamin Harrison Mine* (Quartz).—It is at Jacksonville, and been worked along the hanging-wall side for pockets. — Brown Jacksonville, owner.

*Big Oak Flat* (*Conrad*) *Mine* (Quartz).—It is on Big Oak Flat. shaft has been sunk 50′ on a 4′ vein in granite. The quartz conta gold, tellurium, pyrite, zinc-blende, galena, gray copper, and cha pyrite. H. A. Conrad, of Groveland, owner.

*Birney* (*Hammilfield*) *Mine* (Quartz).—See Hammilfield.

*Black Oak Mines* (Quartz).—See our VIIIth, Xth, XIth, and XI Reports, pp. 665, 744, 500, and 299. They are ½ mile W. of Soulsbyvi and consist of following three claims: *Black Oak*, *Live Oak*, and *W. Oak*, the two latter being prospects. The Live Oak vein is nea parallel to the Black Oak, and dips toward it. On the 600′ le the schistose appearance of the granite walls and the softening of ground were considered an indication of the approaching union of th veins, or at least the proximity of another fissure. The quartz heavily sulphuretted, pyrrhotite being prominent. Thirty-eight n are employed. Black Oak Mining Co., of Soulsbyville, owner; W. Scott, of Sonora, superintendent.

*onanza Mine* (Quartz).—See our VIIIth, IXth, Xth, XIth, and Ith Reports, pp. 652, 37, 736, 511, and 299. Since our last Report mine has been worked continuously. Prospecting for a parallel t is in progress in the upper part of the mine. Three men are loyed. Harriman, Oliver, et al., of Sonora, owners.

*onita Mines* (Quartz).—They are ¼ mile S.E. of Carters, and consist ne *Bonita* and *Garfield*. The latter lies to the east, and approaches Bonita vein going southward. They unite in the Consuella Mine, south of the Bonita. Both veins are in black slate, and each is mpanied by a light gray dike. On the Bonita vein a 440′ adit has n run, and in it, about 300′ from the mouth, a 50′ winze sunk. On Garfield vein a 400′ adit has been driven; about 200′ beyond the ent face of the adit a 70′ shaft has been sunk from the surface, and no machinery. Breese, Angus & Blanc, of San Francisco, owners; Blanc, of Carters, superintendent.

*uchanan Mine* (Quartz).—See our VIth (Part II), VIIIth, Xth, and h Reports, pp. 60, 666, 752, and 494. It is 12 miles S.E. of Sonora. . — Davis and the Barton Estate, of San Francisco, owners.

*uckeye Mine* (Quartz).—See Seminole.

*uzzard's Roost Mine* (Quartz).—See our XIth Report, p. 506. It is iles from Sonora, on the South Fork of the Stanislaus River. It has stamp water-power mill. Vivian & Gerloch, of Sonora, owners.

*anondale Mine* (Placer).—It is at Columbia, and is worked inter- ently. Diego Lorenzo, of Columbia, owner.

*ardinelle Mine* (Quartz).—It is ¼ mile N. of Tuttletown. A shaft been sunk 200′ in chloritic schist, on an irregular quartz vein. Some rich rock was taken from this shaft. P. Keeffe et al., of Sonora, ers.

*arlotta Mine* (Quartz).—See our XIth Report, p. 499. It is ½ mile f Carters, and is an E. and W. vein in granite. Idle. Fred Sutton, Sonora, owner.

*armelita Mine* (Quartz).—It is in the Santa Maria District, 22 miles . of Groveland. Neale & Carter, of Sonora, owners.

*arrie Mine* (Quartz).—It is near Soulsbyville, in granite. Estate of . Coleman, of San Francisco, owner.

*ave Diggings Mines* (Hydraulic).—They are between the North and dle forks of Tuolumne River, 2 miles W. of the Buchanan Mine, contain 155 acres of land located on an ancient river channel. ter is to be taken from Big Cañon to these mines. William Shar- d, of Soulsbyville, owner.

*haparral Mine* (Quartz).—See our XIth Report, p. 496. It is 12 es S.E. of Sonora, near the Buchanan Mine. The veins are in black e, and are developed by several tunnels, 100′ to 600′ long, besides merous surface cuts. Idle. Fred Wenzel, of Sonora, owner.

*himney Rock Mine* (Quartz).—It is 13 miles N. of Columbia, and r the Stanislaus River. The veins are found near the contact of a-schists and a massive quartzose rock of the Calaveras formation. eral tunnels have been run. J. S. Sublette, of Murphy, owner.

*hurchill Mine* (Quartz).—It is in the town of Soulsbyville. See lsby.

*lio Mine* (Quartz).—See our Xth Report, p. 47. It is ½ mile S. of ksonville, and comprises three claims of 1,500′ each in length. There several open cuts and tunnels on the vein. It has a 10-stamp mill.

Clio Mining Co., of Boston, Mass., owner; Samuel Ambrose, of Jacksonville, agent.

*Cloudman Mine* (Quartz).—It is situated between Poverty Hill and Quartz Mountain, and forms a portion of the Erin-go-Bragh, which it joins on the north. Edward Fischer, of Seattle, Wash., owner.

*Coffee-Mill Mine* (Quartz).—It is on the north slope of Jackass Hill, ½ mile S.E. of Robinson's Ferry. It has an old shaft, now caved. McArdle Bros., of Robinson's Ferry, owners.

*Colby* (*Last Chance*) *Mine* (Quartz).—It is a pocket mine, in Sonora, on the Bonanza lead, and is worked by lessees. Two men are employed. Conrad & Colby, of Sonora, owners.

*Columbus Mine* (Quartz).—See our XIIth Report, p. 301. It is 1 mile N. of Carters. Idle. Smith Bros., of Carters, owners.

*Combination Mine* (Quartz).—It is 2 miles N. of the Rawhide Mine, and has only superficial development. R. Chute, of San Francisco, owner.

*Comstock Mine* (Quartz).—It is in slate, near Carters. C. Callender et al., of Sonora, owners.

*Confidence Mine* (Quartz).—See our XIth Report, p. 503. It is 13 miles N.E. of Sonora. Idle for years. The newspapers state (Nov., 1896) that the mine is being reopened and new machinery supplied. It is the principal claim of a group including the *Independence*, *Little Jessie*, and *Plowboy*. Baker & Hamilton, of San Francisco, owners.

*Conlin & Bosovich Mine* (Placer).—See our XIIth Report, p. 301. It is 2 miles E. of Columbia, and is worked by derricks run by water-power. Four men are employed. Conlin & Bosovich, of Columbia, owners.

*Conlin & Graham Mine* (Quartz).—See our XIIth Report, p. 301. It is 2½ miles S.E. of Columbia. Idle. Conlin & Graham, of Columbia, owners.

*Consolidated Eureka Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 664, 750, 498, and 301. It is at Carters (Summerville), and includes the *Dead Horse* and *Eureka* mines. The latter was shut down several years ago, after a successful career. The old workings are connected with those of the Dead Horse down to the 1,280′ level. The former has an incline shaft 1,400′ deep. The vein is of the branching type, characteristic of the East Lode. A fine-grained mica-schist is found in the hanging-wall, and a more quartzose semi-schistose rock on the foot-wall. The vein is usually found separated from the true hanging-wall by a granite dike, which in places also makes its appearance on the foot-wall side. The workings expose a quartz vein, 1′ to 14′ wide, which is usually richer in the narrow, banded portions than in that which is broad and massive. The surface plant includes a hoist and 20-stamp water-power mill. Thirty-one men are employed. A. Hayward et al., of San Francisco, owners.

*Consuella Mine* (Quartz).—See our XIIth Report, p. 301. It is 1½ miles S.E. of Carters, and E. of the North Fork of the Tuolumne River. The developments have been made on each side of a gulch cutting the vein. On the north side a 300′ tunnel has been run and connected by a 125′ shaft with the surface, about 100′ from the face. A winze continues 75′ below the level, making a total depth of 200′ in the shaft. This work has been done on what is called the Mexican shoot, which averages 5′ in width. On the south side of the gulch is the McCarthy shoot, which is at and near the intersection of the Consuella and Garfield veins.

(See Bonita.) An adit on the Consuella, 290′ long, intersects a shaft, 152′ deep, at 100′ from the surface. The shoot is 2½′ to 14′ wide, averaging 5′ where exposed in the workings. D. B. Warfield, of Oakdale, owner.

*Cosmopolite Mine* (Quartz).—See our XIth and XIIth Reports, pp. 494 and 301. It is ½ mile S.E. of Big Oak Flat. It has been worked for pockets for many years. Four men are employed. Poole, Reid, et al., of Groveland, lessees.

*Cowen Mine* (Quartz).—It is at Sonora, on the Bonanza lead, and is worked by lessees for pockets. Two men are employed. Oliver Cowen, of Sonora, owner.

*Crown Point Mine* (Quartz).—It is 10 miles S.E. of Sonora, between Hunter's Cañon and the North Fork of Tuolumne River. The vein is 3′ wide in black slate. Madden & Co., of San Francisco, owner.

*Crystalline Mine* (Quartz).—See our Xth Report, p. 742. It is 1¾ miles N.W. of Quartz Mountain, and includes the Harris, or Winnie claim. There are several tunnels and a large open cut, exposing the vein. Active work is in progress. Ten men are employed. Rapp & Schaffer, of San Francisco, owners.

*Darrow Mine* (Quartz).—See our XIIth Report, p. 301. It is 3½ miles W. of Sonora, and is worked for pockets. Three men are employed. Darrow & Sons, of Sonora, owners.

*Dead Horse Mine* (Quartz).—See Consolidated Eureka.

*Dorsey Mine* (Quartz).—It is at Sonora, on the Bonanza lead. Mrs. Dorsey, of Sonora, owner.

*Draper Mine* (Quartz).—See Whitto.

*Duffield Mine* (Quartz).—It is near Arrastraville, 11 miles N.E. of Sonora. The vein is from 12″ to 18″ wide. Scanavino Bros., of Arrastraville, owners.

*Dundero Mine* (Placer).—It is 2½ miles E. of Columbia. It is worked every spring and summer by ground-sluicing. Louis Dundero, of Columbia, owner.

*Dutch Mine* (Quartz).—See our Xth and XIth Reports, pp. 51 and 509. It is at Quartz Mountain. The shaft had reached a depth of 430′ on August 1, 1896. There is also an air-shaft 200′ deep, connected with the main shaft. Several levels have been opened, the longest being 450′. One shoot is known to be 210′ in length, with ore still in both faces. Several cross-cuts show the channel to consist of an ankerite and mariposite mass, with quartz veins and talc-schist. A new, large working-shaft will be sunk when the extent and trend of the ore-shoot have been determined more fully. Within the past year 5 stamps have been added to the mill, making 10 in all. The capacity is 25 tons per day. The rock contains nearly 3% sulphurets, which are saved on 4 Frue vanners. Thirty men are employed. Dutch Mining and Milling Co., of San Francisco, owner; Albert Trittenbach, of Quartz Mountain, superintendent.

*Eagle Mine* (Quartz).—See our Xth Report, p. 48. It is on Blue Gulch, 2 miles N.W. of Jacksonville. It is an old mine being reopened in connection with the Shawmut Mine. The massive white croppings form a striking feature of the landscape. A long tunnel run in the foot-wall serpentine years ago has been cleaned out and retimbered. (See Shawmut.) Eleven men are employed. L. Rosenfield, A. Halsey, et al., of San Francisco, owners; A. Halsey, of Jacksonville, superintendent.

*East Lode Mine* (Quartz).—It is ½ mile W. of Tuttletown, and h four shafts, 25′ to 65′ in depth, and a tunnel 130′ in length. Patri Mullins, of Tuttletown, owner.

*Elgin Mine* (Quartz).—See Argall.

*Erin-go-Bragh Mine* (Quartz).—It is at Stent, between Quar Mountain and Golden Rule Hill. It has only superficial developme Edward Fischer, of Seattle, Wash., owner.

*Esterbrook Mine* (Quartz).—See Hazel Dell.

*Eunice Mine* (Quartz).—See Argall.

*Eureka Mine* (Quartz).—See Consolidated Eureka.

*Eureka Mine* (Quartz).—See our XIIth Report, p. 302. It is Sonora. There are two veins about 20′ apart, one in black slate, t other in chlorite-schist. The former vein has a shaft 120′ deep, a the latter one 25′ deep, with a 20′ drift at the bottom. J. T. Faxon, Sonora, owner.

*Evans* (*Morse & Evans*) *Mine* (Quartz).—See Hazel Dell.

*Excelsior Mine* (Quartz).—It is 2½ miles N.E. of the Confiden Mine. It was worked in the 60's and is said to have produced half million dollars, much of the quartz milling $60 per ton. An incli shaft was sunk to a depth of 225′, where a fault was encountered a all work was suspended, since which time nothing has been done. Fr Sutton, of Sonora, owner.

*Fairview* (*Last Chance*) *Mine* (Quartz).—It is in Sonora, on t Bonanza vein, being a portion of the original Last Chance locatio Two men are employed. Colby & Conrad, of Sonora, owners.

*Fischer Mine* (Quartz).—It is ½ mile W. of Tuttletown, and has shaft 80′ deep. It has a 5-stamp mill. Idle. J. A. Fischer, of Sonor owner.

*Florence Mine* (Quartz).—See our XIIth Report, p. 302. It is 1 mi S.E. of Tuttletown. H. Orlando, of Tuttletown, owner.

*Ford Mine* (Quartz).—It is on Bald Mountain, 1 mile N.E. of Sonor Two men are employed. — Ford, of Sonora, owner.

*Gamble Mine* (Quartz).—It is 1 mile S. of Groveland, and is worke for pockets. Winslow Hubbard, of Groveland, owner.

*Garfield-Virginia Mine* (Quartz).—See our XIIth Report, p. 302. is 1 mile S. of the Buchanan Mine, and embraces the *Aramenta*, *Virgini* and *Garfield* claims. A tunnel is being run on the Garfield near th Tuolumne River; it is in 300′, and a large quartz vein has been cu The property is well situated for economical working. Four men a employed. Garfield-Virginia Mining Co., of Sonora, owner; J. W. Purd of Sonora, superintendent.

*Garrett Mine* (Quartz).—It is on Bald Mountain, 1 mile N.E. Sonora, and is worked by lessees. Five men are employed. Garre Bros., of Sonora, owners.

*Georgia Mine* (Quartz).—See Seminole.

*Gladdis Mine* (Quartz).—See Argall.

*Gladstone Mine* (Quartz).—See our XIth Report, p. 510. It is o Kanaka Creek, 1 mile E. of Jacksonville. It has considerable supe ficial development. Thomas Whitto et al., of Sonora, owners.

*Gloster Mine* (Quartz).—It is 2 miles S.E. of Carters, joining the Con suella Mine. A tunnel has been run 350′ on the vein from Nigge Gulch, connecting with a shaft 100′ deep. A 25′ cross-cut tunnel ha also been run, near the north end of the mine, to the vein, and a 4

ft run along it. The vein averages 5′, and the pay-streak 2′, in width. e quartz is worked in arrastras. One man is at work. James Gloster, Carters, owner.

*Godfrey* (*Stanley & Bean*) *Mine* (Quartz).—It is on the Joyce ranch, niles N. of Groveland. Two shafts, 35′ and 135′ deep, respectively, ve been sunk on an irregular vein in mica slate. Several hundred s of the vein quartz, mixed with country rock, have been milled. e mine is being reopened under new management. Five men are ployed. E. L. Lowe et al., of San Francisco, owners; T. G. McGuire, Groveland, superintendent.

*Gold Bug Mine* (Quartz).—It is 1½ miles N.W. of Big Oak Flat. Conerable superficial work has been done on veins, about 12″ wide, in rch of pockets. The latest development is on a dike, 18″ wide, that spects well in gold. There is little or no quartz accompanying the ke, which cuts the black slate. One man is employed. R. T. Sorenn, of Big Oak Flat, owner.

*Gold Hunter Mine* (Quartz).—It is on the East Lode, 11 miles S.E. Sonora. It has several tunnels and shafts of unknown extent. The chinery has fallen into decay. P. J. Sullivan, of San Francisco, ner.

*Gold Nugget Mine* (Quartz).—See Merritt.

*Golden Eagle Mine* (Quartz).—It is on Big Oak Flat. Undeveloped.

*Golden Gate Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, . 738, 511, and 302. It is 1 mile S.W. of Sonora. The shaft is 725′ ep. Since our last Report considerable exploration has been done—oss-cutting, etc.—but the mine is no deeper. Several new pay-shoots, is claimed, have been discovered in the cross-cuts. The 10-stamp mill s been enlarged to 20 stamps. Twenty men are employed. Consolicted Golden Gate and Sulphuret Mining and Development Co., of nora, owner; Samuel Smitherum, of Sonora, superintendent.

*Golden Rock Mine* (Quartz).—It is on the north side of Big Oak Flat, d is worked for pockets. It has a 40′ shaft, a tunnel over 400′ long, d numerous open cuts. A new tunnel is projected, to cut the vein der the shaft at a depth of 150′ from the surface. One man is ployed. H. A. Conrad, of Groveland, owner.

*Golden Rule Mine* (Quartz).—See our Xth Report, p. 50. It is on lden Rule Hill, ½ mile S. of Stent, or Poverty Hill. The mine was rked in the 60's and early 70's to a depth of 200′ and produced $38,500 1870 and $10,000 in 1871. (See Mineral Resources West of the Rocky ountains, for 1871 and 1872, pp. 33 and 62.) Open cuts are found on o separate veins of amphibolite-schist. Recently the mine has been opened and a large amount of development work done. The adit level is cross-cut, 528′ long, and enters the hill from the west, or foot-wall, side. he main drift runs N. and S. from the tunnel, and is nearly 1,000′ long a zone of chlorite-schist, containing gold and auriferous pyrite, and ong the foot-wall side of the zone narrow veins of quartz and calcite, ch in gold; associated with this streak is a dike which is often found contain a reticulated mass of veinlets of quartz and calcite, also rich gold. A 70′ shaft connects with the surface 150′ from the north face the drift. A cross-cut has been run 200′ W. from a point near the aft, which exposes two other gold-bearing zones or veins, separated by ′ of diorite. One of these veins is gold-bearing amphibolite-schist; e other is much altered ankerite, with mariposite, containing quartz

gold and auriferous pyrite. The hanging-wall country rock for 1,0 or more east of the more easterly vein is composed entirely of amphi olite-schist, with small veins of quartz and dikes, and has been sluic off years ago. It is not improbable that this schistose rock will also found to contain auriferous zones. East of this schistose area is diaba of a normal type. The west or foot-wall country consists of diorit separated from the lode by a strip of serpentine over 100′ wide. T cross-cut is started in this rock. The succession of rocks as exposed the cross-cut is a large mass of greatly altered ankerite, with mariposit separated from the serpentine by a heavy gouge. A dike of diorit similar to that in the west country, separates the ankerite mass from second similar zone. Lying east of the ankerite zone is a succession diorite and diabase rocks, partly altered into amphibolite-schist, whi in the zones above described are gold-bearing. On the surface a lar quartz cropping is seen on the hanging-wall side of the ankerite are which has not as yet been found in any of the underground working The above geological description may be taken as characteristic of t Mother Lode belt in Tuolumne and Mariposa counties. It would see that the amphibolite-schists should receive more attention. A 5′ x double-compartment shaft, now 270′ deep, is being extended to 600′ i depth. The 10-stamp water-power mill is idle. Twelve men a employed. Golden Rule Mining Co., of Stent, owner; E. A. Stent, Stent, superintendent.

*Golden Star Mine* (Quartz).—It is a pocket mine, near Big Oak Fla It has a tunnel 500′ long. James Bros., of Groveland, owners.

*Good Shepherd Mine* (Quartz).—It is 3 miles N. of Soulsbyville, an is a new prospect, in granite. A shaft is being sunk on the vein, whic averages 12″ in width. Three men are employed. W. H. Barron, Soulsbyville, owner.

*Grant Mine* (Quartz).—It is near Moccasin Creek, at the foot of Priest Hill. A shaft has been sunk 100′ on a dike containing 4% or 5% pyrite. A cross-cut is being driven east in the foot-wall to cut the dik Two men are employed. Grant Gold Mining Co., of Oakland, owne J. J. Hughes, of Chinese Camp, superintendent.

*Gray Eagle Mine* (Quartz).—See Santa Ysabel.

*Grizzly Mine* (Quartz).—It is on the East Lode, 1 mile S.E. of Carter It has a shaft 100′ deep. Idle. William Sharwood et al., of Soulsby ville, owners.

*Grizzly-Eureka Mine* (Quartz).—It is ¼ mile N. of Priests. The prop erty comprises two claims, on each of which considerable work has bee done. The gold is found in black slate at the contact with or near smal dikes of intrusive rock, which cut the formation. Considerable gold wa also found along a fault that had dislocated a small quartz vein. Th displacement was only a few inches. Two men are employed. Harpe Bros., of Groveland, owners.

*Gross Mine* (Quartz).—It is at Tuttletown, and has a shallow shaft Frank Gross, of Tuttletown, owner.

*Hammilfield* (*Ham & Birney*) *Mine* (Quartz).—It is on Five-Mil Cañon, 7 miles N.E. of Columbia. The vein dips 25° to 30° S.E., an strikes N.E., in mica-schist and quartzite of the Calaveras formation and has a dike on one or both walls. It is 1′ to 6′ wide, and is worke through six adits, which are from 100′ to 380′ long, the four upper one being about the latter length. There is a 10-stamp mill, but no con

ntrators, the quantity of sulphurets being very small. Operations spended. Hammilfield Mining Co., of San Francisco, owner; William arwood, of Soulsbyville, superintendent.

*Hancock Mine* (Quartz).—It is 2½ miles W. of Tuttletown, near Daniels at. The main vein is exposed in an open cut and 60′ shaft. This ork has been done at a point where a split occurs in the vein, one anch turning off in a sweeping curve to the west. Pablo Rodriguez, Tuttletown, owner.

*Hayes Mine* (Quartz).—It is on the south side of Tuolumne River, 2 iles S.E. of Jacksonville. Developed by several short tunnels. Thomas ayes, of Jacksonville, owner.

*Hazel Dell Mines* (Quartz).—They are 9 miles N. of Soulsbyville, and nsist of the *Esterbrook*, *Evans*, and *Hazel Dell*. The veins are from 1′ 3′ wide, and are found partly in the mica-schist and quartzite of the laveras formation and partly in grano-diorite. The most easterly in is the Esterbrook, on which is a cut 30′ long and 12′ deep, exposg a vein 1′ thick, accompanied by a dike. The next vein, on the azel Dell, lies 580′ N. and is 2′ to 2½′ wide, which is also accompanied a dike. The principal vein of the Hazel Dell lies 190′ N. of the st described, and is from 12″ to 30″ wide, with a dike on the hanging-ll side. It has a shaft 80′ deep and a tunnel 100′ long on the vein, tting the shaft 30′ from the surface. A small mill was built here ars ago. Afterward a cross-cut tunnel was started in Sawmill Gulch, out 400′ from the vein, the object being to drain the mine and work ore economically. All the operations were suspended when work on e tunnel ceased in 1854; since which time nothing has been done til recently. The mine has been cleaned out and prospect work is ing done. There is a large amount of fine-appearing quartz, carrying lphurets of iron, lead, and copper. The Evans vein is in granoorite, and 580′ N. of the Hazel Dell; a shaft, now caved, was sunk in rly days, and a mill built. It was afterward burned, and the mine as been idle for years. Three men are employed. William Sharwood, Soulsbyville, owner.

*Hector Mine* (Quartz).—It is 3 miles N.W. of Jacksonville. It was orked in early days, but these workings are now closed. J. L. Whitney, Quartz Mountain, owner.

*Henrietta Mine* (Quartz).—See our XIIth Report, p. 302. It is on the orth Fork of Tuolumne River, 4 miles N.E. of Carters. The vein is eavily sulphuretted. C. F. Haslam, of Sonora, owner.

*Heslep Mine* (Quartz).—See App & Heslep, and our VIIIth and Xth eports, pp. 661 and 51.

*Hibbing Mine* (Quartz).—It is 1 mile N. of Soulsbyville. It has a haft 70′ deep, on a vein in granite. Idle. Hibbing Bros., of Soulsbylle, owners.

*Hidden Treasure Mine* (Quartz).—It is 1¼ miles S.W. of Priests, near obbs Creek. This is a new prospect, on which there are several open its and a 40′ shaft, in a mass of diorite of coarse texture, abundantly npregnated with pyrite, quartz, and calcite. Two men are employed. hodes & Flack, of Stockton, owners.

*Hitchcock Mine* (Quartz).—It is on Quartz Mountain. See App & leslep.

*Hoffman* (*Ready*) *Mine* (Quartz).—It is 4½ miles N. of Groveland. It as a shaft 135′ deep.

*Homestake* (*Rising Sun*) *Mine* (Quartz).—It is on the south side Blue Gulch, 1½ miles N. of Jacksonville. A tunnel is being driven the vein from the north. Two men are employed. Judge Waymi of Alameda, owner.

*Homestead Mine* (Quartz).—It is situated on the North Fork Tuolumne River. The vein is 2′ to 3′ wide. Charles Howland, of L Angeles, owner.

*Hope Mine* (Quartz).—It is on the Bonanza lead, ½ mile E. of Sono and is worked in a small way. Two men are employed. Ralston Arillo, of Sonora, owners.

*Hyde Mine* (Quartz).—See Bellevue.

*Independence Mine* (Quartz).—It is ¼ mile N.E. of Tuttletown, a has some superficial development, made in searching for pockets. W. Neville and John Penrose, of Tuttletown, owners.

*Independence Mine* (Quartz).—See Confidence; also our XI Report, p. 503.

*Isabella and Gem Mine* (Quartz).—It is ¼ mile N. of the Rawhi Mine, and is well situated for economical development and working. has a 30′ shaft, and a tunnel is now being run by contract. Two m are at work. J. T. Faxon, of Sonora, owner.

*James Mine* (Quartz).—It is a pocket mine, 1 mile N.W. of Grov land. James Bros., of Groveland, owners.

*Joe Hooker Mine* (Quartz).—It is in the granite, near Carters, a has a small vein of what is claimed to be good pay quartz. The equi ment consists of a 5-stamp water-power mill. P. B. Bacon, of Sonor owner.

*Jumbo Mine* (Quartz).—It is on the Burns ranch, 1 mile W. Soulsbyville. The vein, 4′ to 8′ wide, strikes E. and W., in granite. 90′ shaft and several surface cuts constitute the development. It is no flooded and idle. James Burns, of Soulsbyville, owner.

*Jumper Mine* (Quartz).—See our Xth Report, p. 50. It is on t south end of Golden Rule Hill, ¾ mile S. of Stent. The shaft is 32 deep, and levels have been run from the 100′, 200′, and 300′ station It is quite similar to the Golden Rule, geologically. It is equipp with a steam hoist and a new 20-stamp mill, with 1,030-lb. stamp no concentrators. Fifty men are employed. Jumper Gold Minin Syndicate, of Glasgow, Scotland, owner; H. W. Coffin, of Stent, supe intendent.

*Junction Mine* (Quartz).—It is on the Yost ranch, 1 mile S. of Soul byville, on what is presumed to be the junction of the *Black Oak* an *Soulsby* veins. At present the development is superficial, but a shaft i being sunk by a company which has bonded the property. Six me are to be employed. John Yost, of Soulsbyville, owner.

*Kaiser Mine* (Quartz).—It is on Bald Mountain, 1 mile N.E. Sonora, and is worked for pockets. F. W. Buckwalter, owner.

*Kanaka Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 66 and 303. It is 5 miles E. of Groveland. Since our last Report a cross cut tunnel has been driven into the vein from a point back of the mill which greatly facilitates the working of the mine. The mill is onl run during the season when water is abundant. Five men are usuall employed. Louis Cassaretto, of Groveland, owner.

*Karrington* (*Stenchfield*) *Mine* (Quartz).—It is on Jackass Hill, 1 miles N.W. from Tuttletown, and is one of the noted pocket mines o

locality. Four men are employed. James Gillis, of Tuttletown, ner.

*Keltz Mine* (Quartz).—See our VIth (Part II), Xth, XIth, and XIIth ports, pp. 59, 755, 504, and 303. It is 10 miles N. of Soulsbyville, on cañon of the South Fork of Stanislaus River. It has been worked tinuously during the past two years. It has four adit levels, from 0′ to 1,100′ in length; the quartz from the upper levels being sent to mill by inclined tramways. The vein occurs in the slates and artzites of the Calaveras formation, accompanied by a dike, being ilar geologically to many of the mines of the East Lode. For- rly the mine had two mills of 10 stamps each. The old mill, stand- g on an insecure foundation, on a steep mountain side, was torn down d 5 stamps added to the mill built in 1893. The capacity of the mill now 30 tons daily. Twenty-six men are employed. The Leechman ospecting Co., of San Francisco, owner; William Sharwood, of ulsbyville, superintendent.

*Kelvin Mine* (Quartz).—It is on the North Fork of Stanislaus ver, and has a vein 2′ to 5′ wide. Leechman & Co., owners.

*Kephart Mine* (Quartz).—It is 2½ miles S.W. of Carters, and is in the ospective stage. S. Kephart, of Carters, owner.

*King Solomon Mine* (Quartz).—It is ¾ of a mile W. of Tuttletown, d is opened by a cross-cut tunnel 200′ long, from which drifts 100′ ng have been run. The mineralized zones have been intersected by e cross-cut, and show considerable quartz and chloritic-schist contain- g auriferous pyrite. Three men are employed. A. O. Viertong, of ttletown, owner.

*Knox & Boyle Mine* (Quartz).—See Santa Ysabel, and our Xth Report, 51.

*Kriss-Kross Mine* (Quartz).—See our XIIth Report, p. 303. It is a cket mine, 1 mile N. of Priests. It has a shaft and two tunnels. J. Hughes, of Chinese Camp, owner.

*Lady Washington Mine* (Quartz).—See our Xth, XIth, and XIIth ports, pp. 752, 498, and 303. It is ¼ mile S.E. from Carters, joining e Dead Horse on the south. The mine has several adits, from 100′ to 0′ in length. Idle. — Hooper et al., of San Francisco, owners.

*Lamphyre Mine* (Quartz).—See our XIth Report, p. 503. It is at Con- ence, and has been dismantled; the machinery being taken to the ppahannock Mine. Richard Chute, of San Francisco, owner.

*Last Chance Mine* (Quartz).—It is on Kincaid Flat, 3 miles S. of nora. A shaft is being sunk on a vein of peculiar, watery quartz, 3′ 5′ wide, which is quite rich in gold. It also carries auriferous iron d copper sulphurets. Three men are employed. William Hunter, of nora, owner.

*Last Chance* (*Colby*) *Mine* (Quartz).—It is a pocket mine in Sonora, on e Bonanza lead, and is producing handsome specimens. Two men are ployed. Colby & Conrad, of Sonora, owners.

*Laura and North Star Mine* (Quartz).—See our XIth and XIIth ports, pp. 498 and 303. It is on the East Lode, between Carters and herokee. These claims are worked as one mine. The Laura has a 0′ and the North Star a 200′ shaft. The veins, of which there are veral, lie nearly parallel in granite. Several cross-cuts have been run d other underground prospecting done since 1893, but all work was spended in 1895, and the mines are now flooded. Laura and North

Star Mining Co., of Sonora, owner; D. Oliver, of Sonora, superintendent.

*Lead Mine* (Quartz).—See our Xth Report, p. 56. It is ½ mile W. Tuttletown. In former years it is claimed this mine produced some ve rich gold quartz, and also contained considerable galena. The pay-rc is found in a mass of ankerite and mariposite, between walls of amph olite-schist. A shaft has been sunk, and a cross-cut tunnel is bei driven to reach a point on the vein under the shaft. Four men a employed. W. B. Clement, of Tuttletown, owner.

*Lena Belle Mine* (Quartz).—See Seminole.

*Little Gem Mine* (Quartz).—See our VIIIth, Xth, and XIth Repor pp. 663, 742, and 506. It is 1 mile W. of Jamestown. It is a fractior claim, which cuts out a portion of the rectangular Trio claim. T excavations have been chiefly in the amphibolite-schists, which lie e of the massive vein of quartz and ankerite. It has a 10-stamp mill, r by a 30′ overshot water-wheel. Four men are usually employed. Her ley Bros., of Jamestown, owners.

*Little Jessie Mine* (Quartz).—See Confidence.

*Little Wonder Mine* (Quartz).—It is 2 miles N.W of Big Oak Fl The two veins occur in black slate, accompanied by dikes. The qua is banded, and contains pyrite and a small percentage of galena. T veins are opened by inclines and several surface cuts. Three men a employed. Bonded to David Hartz, of Big Oak Flat.

*Live Oak Mine* (Quartz).—See Black Oak.

*Longfellow* (*Butler*) *Mine* (Quartz).—See our VIIIth and XIth Repor pp. 672 and 494. It is on the north side of Big Oak Flat. A 140′ sh was sunk some years ago. Idle. D. F. Longfellow, of Big Oak Fl owner.

*Lookout Mine* (Quartz).—See Peña Blanco.

*Louisiana Mine* (Quartz).—It is 1 mile N.W. of Carters. Un recently it has been idle, and flooded since 1881, but was reopened 1895. The shaft was found to be 370′ deep. The vein is in grani The mine is equipped with water-power hoist, with a steam plant accessory. No mill. Operations are again suspended. Margar McCormick, of Sonora, owner.

*Lucky Star Mine* (Quartz).—See Peña Blanco.

*Lumsen Mine* (Quartz).—See our XIth and XIIth Reports, pp. 4 and 303. It is worked occasionally for pockets. D. Lumsen & Son, Big Oak Flat, owners.

*Mack Mine* (Quartz).—It is on the north side of Big Oak Flat. Th vein runs from a few inches to 8′ thick, in grano-diorite. A new sha has been sunk 150′ and a cross-cut tunnel run 100′. It has a goo hoisting and pumping plant. Five men are employed. Albert Mack al., of Big Oak Flat, owners.

*Mammoth* (*Webster*) *Mine* (Quartz).—See our Xth Report, p. 47. is ½ mile N. of Jacksonville. The claim is 2,200′ in length. The pro erty has been opened extensively, and development is still in progres Driven to the vein from the west there are four cross-cut tunnels, 80′, 19 340′, and 673′ long, respectively; the last being the lowest and main adi it has intersected a large vein, and a station was cut out in the hangin wall, a winze sunk, and a complete hoisting plant installed. Gradir for a 10-stamp mill has been completed. A ditch and flume, 4 miles i length, have also been built, from the confluence of Woods and Sulliva creeks, to furnish 500 miner's inches of water under 100′ pressure. Th

*utt Mine*, adjoining the Mammoth on the south, constitutes a portion f he property, and will be worked jointly with it. Thirty-eight men r employed. Sierra Buttes Mining Co., of San Francisco, owner; J. F. lett, of Jacksonville, superintendent.

*Martha Washington Mine* (Drift and Hydraulic).—See our XIIth ort, p. 303. It is on Table Mountain, 5 miles W. of Chinese Camp. . Martha Washington Mining Co., of Oakland, owner.

*Mary Mine* (Quartz).—It is 1 mile N.E. of Arrastraville, and has a 4′ . W. H. Barron, of Soulsbyville, owner.

*Mary Ellen Mine* (Quartz).—See our XIth Report, p. 494. It is 5 es N. of Groveland. Idle. Jabez Howes, of San Francisco, owner.

*Marryat Mine* (Quartz).—It is at Tuttletown, and has been opened to a th of 200′, but is now dismantled. James Gillis, of Tuttletown, owner.

*Mascot Mine* (Quartz).—It is a prospect, 1½ miles W. of the Rawhide le. Mrs. Rickert, of Sonora, owner.

*May & Hunter Mine* (Quartz).—It is on Wolfley's Hill, ¼ mile E. of ora, and is worked for pockets. Two men are employed. Charles g, of Sonora, owner.

*Mayflower Mine* (Quartz).—It is 1 mile S.W. of Carters, and is a claim he Seminole group. Several tunnels have been run cross-cutting the nation, the longest being 300′. These workings pass through a zone recciated rock, which appears to have been mica-schist and quartzite, now much altered and intruded by irregular masses and veinlets of e rock. The entire zone, 65′ wide, is very soft, much decayed, and ned with iron oxide. Gold is found near the foot-wall side, where e stoping has been done on a vein-like mass, consisting of a peculiar ular, semi-opal quartz. Two men are employed. Seminole Mining owner; J. L. Coles, of Carters, manager.

*Mazeppa Mine* (Quartz).—See our XIth Report, p. 509. It is a pros- t, 1 mile S. of Stent. It has a 60′ shaft and several surface cuts. A shaft is being sunk, under contract by parties holding a bond on . Four men are employed. William Harris, of Jamestown, owner.

*McAlpine Mine* (Quartz).—See our Xth Report, pp. 43 and 44. It is iles N.W. of Coulterville. Idle. Estate of Peter Wynans, of Oak- d, owner.

*McCann Mine* (Quartz).—It is ½ mile W. of Jamestown, and has only erficial development. A. Hayward et al., owners.

*McCure Mine* (Quartz).—See Argall.

*McTarnahan Mine* (Drift).—It is 2½ miles W. from Sonora, on the le Mountain channel. A tunnel has been driven, through slate rock, from the west side of the mountain to tap the channel. Two n are employed. Frank McTarnahan, of Sonora, owner.

*Means & Wilson Mine* (Quartz).—It is on Jackass Hill, 1¼ miles W. of Tuttletown. It has been famous for years as a pocket mine. The formation is amphibolite-schist, through which is found numerous parallel fissures and many small seams of quartz and calcite. The gold pockets are found at the intersection of seams and veins, or fissures, and is frequently found associated with small dikes. The surface is a labyrinth of holes, where miners have been working for years. The mine is now worked by a system of leases, six separate parties working various portions of the property. Twelve men are employed. James Gillis, of Tuttletown, owner.

*Merritt and Gold Nugget Mines* (Quartz).—They are 2 miles S. of Oak Flat, and form a single property, which has been opened since last Report. A 110′ shaft has been sunk, with windlass and horse-wh and the owner is about to put in a steam hoist. The vein is opened various points along 1,000′ or more of the surface, and is found tc from 2′ to 5′ wide. It consists of a zone of slate and quartz, carryin small percentage of sulphurets. The walls are well defined. Four n are employed. E. B. Burdick, of Groveland, owner.

*Mexican Mine* (Quartz).—See Urquhardt.

*Miller & Holmes Mine* (Quartz).—See Santa Ysabel, and our XI Report, p. 304.

*Mina Verde Mine* (Quartz).—It is on the South Fork of Tuolun River. The vein is 1′ to 2′ wide. Bluett & Co., of Columbia, owners

*Miranda Mine* (Quartz).—See Argall.

*Mississippi Mine* (Quartz).—It is on the lower end of Big Oak F It was reopened in 1894 and a hoist and mill built, but after clean out the shaft, work was suspended, since which time it has been ic John McLaughlin, of Coulterville, Mariposa County, owner.

*Mohawk Mine* (Quartz).—It is on the North Fork of Tuolun River. The vein is 2′ wide. E. C. Brooks, of San Francisco, owner.

*Monitor Mine* (Quartz).—It is 3 miles N.W. of Confidence, on North Fork of Tuolumne River. The vein averages 2′ in width. Jc Neale et al., of Sonora, owners.

*Monte Cristo Mine* (Quartz).—It is 25 miles E. of Groveland, in Sa Maria District. The vein is 20″ wide, and is in granite. John H. Ne et al., of Sonora, owners.

*Mooney Mine* (Quartz).—It is 1 mile N. of Quartz Mountain. A cross-cut tunnel has been driven, cutting the vein 40′ from the mou A. Hayward et al., of San Francisco, owners.

*Mormon Mine* (Quartz).—It is a prospect on Big Oak Flat, and is extension of the Mississippi. Idle. F. Marconi et al., of Big Oak Fl owners.

*Mother Lode Mine* (Quartz).—It is ¾ of a mile W. of Tuttletown, a is opened by two tunnels, 150′ and 380′ long, respectively. Two m are employed. Patrick Mullins, of Tuttletown, owner.

*Mount Jefferson Mine* (Quartz).—See our XIIth Report, p. 304. I at Groveland. Idle and inaccessible. J. H. Brown, of Boston, Ma owner.

*Mount Stanislaus Mine* (Quartz).—It is on the north slope of Ja ass Hill, 1½ miles N.W. of Tuttletown. Only superficial workin McArdle Bros., of Robinson's Ferry, owners.

*Mount Vernon Mine* (Quartz).—It is 2½ miles N.E. of Confiden Four cross-cut tunnels have been driven in from the hanging-wall si two of which have reached the vein. It was worked in the 50's, anc said to have been rich. Fred Sutton, of Sonora, owner.

*Mount Zion Mine* (Quartz).—It is 1 mile E. of Groveland and l a 100′ shaft. Idle. Louis Casseretto, of Groveland, owner.

*Neale Mine* (Quartz).—It is ½ mile E. of Sonora, and is worked pockets. Four men are employed. Mrs. J. H. Neale, of Sonora, own

*Never-Sweat Mine* (Quartz).—See our XIIth Report, p. 304. It is mile N.E of Priests. Since our last Report, a 300′ cross-cut tunnel l been driven toward the vein. One man is at work. James Ballenti of Big Oak Flat, owner.

*Never-Sweat Mine* (Quartz).—It is 1 mile N. of Columbia, and is worked in a desultory way for pockets. Peterson & Keefe, of Columbia, owners.

*New Albany Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 665, 752, 497, and 304. It is on the North Fork of Tuolumne River, 1 mile N.E. of Carters. The operations, commenced in 1863, were of short duration. Idle. Ballard & Martin, of San Francisco, owners.

*New Era Mine* (Quartz).—See our XIth Report, p. 509. It is situated between the *Golden Rule* and *Jumper* mines. It has an 80′ shaft and a few surface cuts. A drift is being run from the 200′ station of the Jumper Mine into this ground. Jumper Gold Mining Syndicate, of Glasgow, Scotland, owner; W. H. Coffin, of Stent, superintendent.

*Nonpareil Mine* (Quartz).—It is 1½ miles N.W. of Groveland. Idle. Joseph Raggio, of Groveland, owner.

*Noonday Mine* (Quartz).—It is on Rose Creek, above Italian Bar. The vein is 2′ to 3′ wide. It has a 5-stamp mill. Woodside & Co., of Woodsdale, owners.

*North Extension Mine* (Quartz).—It is 2½ miles N. of Table Mountain, and has only superficial development. R. Chute, of San Francisco, owner.

*North Fork* (*Donnella*) *Mine* (Quartz).—See our XIIth Report, p. 304. It is 2½ miles N.E. of Carters. Since our last Report a new shaft has been sunk 150′, and a vein, presumed to be the extension of the one faulted near the surface, has been found. Thomas Soulsby, of Soulsbyville, owner.

*North Star Mine* (Quartz).—See Laura and North Star.

*North Star Mine* (Quartz).—It is 1½ miles N.W. of Jacksonville. A cross-cut tunnel is being driven through the foot-wall country rock which is calculated to reach the vein in 400′. Five men are employed. North Star Mining Co., of Chinese Camp, owner; C. C. Stone, of Jacksonville, superintendent.

*Nubaumer Mine* (Quartz).—It is a prospect, on Thompson Hill, 1 mile N. of Tuttletown. — Nubaumer, of Tuttletown, owner.

*Nyman Mine* (Quartz).—See Santa Ysabel.

*Ohio Mine* (Quartz).—It is 3 miles N. of Soulsbyville. The vein is in granite and about 1′ in width. It has a 5-stamp water-power mill. W. B. Bacon, of Sonora, owner.

*O. K. Mine* (Quartz).—See our XIth Report, p. 508. It is 2 miles N.W. from Table Mountain, and west of Tuttletown. It is a large vein consisting of quartz in ankerite, with mariposite. The development is superficial. R. Chute, of San Francisco, owner.

*Old Tuolumne Mine* (Quartz).—See our XIIth Report, p. 305. It is on the South Fork of Stanislaus River, 4 miles N. of Columbia. Idle. Lary Bros., of San Francisco, owners.

*Ophir Mine* (Quartz).—See our XIIth Report, p. 305. It is 1 mile N. of Big Oak Flat. Idle. James Bros., of Groveland, owners.

*Orcutt Mine* (Quartz).—See Mammoth.

*Pacific Mine* (Quartz).—It is ½ mile W. of Quartz Mountain. It has a shaft 45′ deep, and a few surface cuts in amphibolite-schist. Idle. O. S. Soulsby, of Stent, owner.

*Page* (*Simonich*) *Mine* (Quartz).—See our XIIth Report, p. 305. It is 1 mile N.E. of Sonora, and has been worked extensively and suc-

cessfully for pockets. Six men are employed. Mrs. Pedro, of Sono owner.

*Palo Alto Mine* (Quartz).—It is on the South Fork of Stanisl River, and has a 2′ vein. J. Donovan, owner.

*Parole Mine* (Quartz).—It is 3 miles N. of Soulsbyville. The v is 1′ to 2′ wide in granite. A 150′ inclined shaft has been sunk an steam hoist erected. Idle. W. H. Barron, of Soulsbyville, owner.

*Patterson Mine* (Quartz).—See our VIIIth and Xth Reports, pp. and 656. It is ½ mile W. of Tuttletown, and has been worked to a de of 70′, but is now idle. Joseph Podesto, of Tuttletown, owner.

*Peña Blanco Mines* (Quartz).—They are 1½ miles W. of the Rawh Mine, and consist of the *Peña Blanco*, *Doctor*, *Lookout*, *Lucky Star*, a *Sarah Francis*. The Peña Blanco is the principal claim, and is the o one having any development. The quartz croppings are massive, cov ing the summit of the hill for a width of nearly 150′. A fault has d placed the vein near the surface, which, with large bowlders of qua detached from the main mass, lie scattered about, partly imbedded the soil, tending to give the impression, on casual inspection, of a v of enormous width. As a matter of fact, however, the vein is expo 30′ in width, and appears to be separated from a second vein lying b in the foot-wall, the width of which is unknown, though apparen large. The separating material consists of clay and slaty rock, w much quartz in small veins. A cross-cut tunnel has been driven 1 in the hanging-wall, but has not yet reached the vein. At a point so of the cut, a second cross-cut tunnel has been run 200′, which l penetrated the vein here 5′ wide, consisting of bluish, banded qua A 5-stamp mill has been erected and a quantity of rock crushed. Id Dr. J. L. Ross et al., of Redwood City, San Mateo County, owners.

*Pennsylvania Mine* (Quartz).—See our XIth Report, p. 500. It ½ mile N. of Carters, near the Laura and North Star Mine. It has t 50′ shafts. The vein is in granite. Fred Sutton, of Sonora, owner.

*Pennsylvania Mine* (Quartz).—See Soulsby. It is at Soulsbyville, a has a 300′ shaft.

*Philadelphia Diggings* (Hydraulic).—See our XIIth Report, p. 3 They are 10 miles N.E. of Columbia. Idle. W. H. Sharp, of San Fr cisco, owner.

*Philadelphia and Rhode Island* (*Martin*) *Mines* (Quartz).—They on the East Lode, 2 miles S. of Carters, on the east side of the North F of Tuolumne River, at about 3,500′ elevation. They are a relocation the old *Martin* Mine, and are 600′ by 2,335′ in extent. The vein is s to be 10″ to 30″ wide, in bluish-gray slate containing quite a percent of pyrites. They are exploited by three tunnels on the vein, 60′, 4 and 320′ in length respectively. Some stoping was done in the 6 and the ore reduced in arrastras. Active operations were resumed t year. Goldwin Mining Co., of No. 63 Wall Street, N. Y., owner; W. McClintock, of Sonora, superintendent.

*Pine Log Mine* (Quartz).—It is 3 miles N. of Columbia, in the ca of the Stanislaus River, and is a new location. The vein occurs crystalline limestone, and has formed in a fissure between two sheets dike rock. The quartz is rich, and shows considerable gold. One m is at work. August Wiedekind, of Columbia, owner.

*Pine Ridge Mine* (Quartz).—It is 2 miles W. of Jamestown. It ha shaft 100′ deep, on a vein 16″ to 4′ wide. Idle. E. A. Stent, of Ste owner.

*Pi-Ute Mine* (Quartz).—It is a prospect on the North Fork of Tuolumne River, 4 miles N.E. of Carters. C. F. Haslam, of Sonora, owner.

*Platt & Gilson Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 666 and 746. See Soulsby.

*Plowboy Mine* (Quartz).—See Confidence.

*Pride of Tuolumne Mine* (Quartz).—It is a prospect, 1 mile W. of Tuttletown. Mrs. Rikert, of Sonora, owner.

*Prudhome Mine* (Quartz).—It is at Arrastraville. The vein is 1′ to 2′ wide, in black slate. Frank Prudhome, of Sonora, owner.

*Puerto-Fino Mine* (Quartz).—See our XIIth Report, p. 499. It is ½ mile N.W. of Carters, in granite. Idle. William Sharwood, of Soulsbyville, owner.

*Raggio Mine* (Quartz).—See Nonpareil.

*Rappahannock Mine* (Quartz).—It is at Rawhide, and ½ mile N. of Table Mountain. Since our XIIth Report was issued a new shaft has been sunk 400′, and a drift and cross-cut started at that level for the purpose of finding the pay-shoot. The shaft has been sunk entirely in serpentine, which lies along the west side of the vein. Northward from the shaft, quartz and amphibolite-schist are found, and at one point a heavy gouge, evidently the main fissure, but no work has been done at that point. In cross-cutting and drifting some very rich quartz has been encountered. It is supplied with a good hoisting plant. Fourteen men are employed. R. Chute, of Jamestown, owner and superintendent.

*Rawhide Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 505, 507, and 306. It is the second claim on the gold belt N. of Table Mountain. The shaft commenced in 1891 is said to be 1,000′ deep. Admission to the mine was refused, and only hearsay information obtainable. Since the XIIth Report, a chlorination plant, with a single Bon furnace, was built in 1895, and a second similar furnace constructed in 1896. One hundred men are employed. W. H. Martin & Co. et al., 205 Crocker Building, San Francisco, owners; W. A. Nevills, of Jamestown, superintendent.

*Rawhide No. 2 Mine* (Quartz).—It is the first claim S. of the Rawhide. Idle. A. Hayward et al., of San Francisco, owners.

*Red Jacket Mine* (Quartz).—It is near Big Oak Flat. The vein is from 1′ to 4′ wide. Louis Rapetto, of Big Oak Flat, owner.

*Republican Mine* (Quartz).—See our Xth Report, p. 47. It is at Jacksonville. It has been exploited for pockets. It has a 5-stamp mill. W. Lemmon, of Jacksonville, owner.

*Rhode Island Mine* (Quartz).—See Philadelphia.

*Richards* (*Summers*) *Mine* (Quartz).—It is ½ mile S.E. of Carters, and is opened by tunnels, 150′ and 200′ long, respectively. Idle. W. S. Chapman, of San Francisco, owner.

*Rikert Homestake Mine* (Quartz).—It is a prospect on Daniels Flat, 1 miles W. of Tuttletown. Edwin Rikert, of Tuttletown, owner.

*Rising Sun* (*Sonora Extension*) *Mine* (Quartz).—See our Xth and XIth Reports, pp. 748 and 502. It is on Turnback Creek, 9 miles E. of Sonora. A large amount of work has been done on this mine. The vein is said to be 1′ wide, and high-grade. Idle. Sonora Extension Mining Co., of Sonora, owner; J. H. Neale, of Sonora, superintendent.

*Ritchie Mine* (Quartz).—It is ½ mile W. of Tuttletown. It is a pocket mine, in diabase, and has several hundred feet of tunnels, upraises, etc.

The quartz is crushed in a water-power arrastra, located a short dista from the mouth of the lowest tunnel. W. E. Nevills, of Tuttleto owner.

*Riverside Mine* (Quartz). It is 11 miles N. of Soulsbyville, on South Fork of Stanislaus River. It was worked years ago throu tunnels, but has long been idle. Williams Bros., of San José, owners

*Ross Mine* (Quartz).—It is a prospect, 1½ miles S.W. of Tuttleto Mrs. Rikert, of Sonora, owner.

*Royal Granite Mine* (Quartz).—It is a new location, 1¼ miles S. Priests. An incline has been sunk 40′ on an 18″ vein, in diorite. sides some visible gold the quartz contains coarsely crystallized s phides of iron and copper. Two men are employed. Price & Lums of Big Oak Flat, owners.

*Sailor Boy Mine* (Quartz).—It is on the Stanislaus River, 13 mi N. of Columbia. It has been opened by several tunnels, 50′ to 300′ length. The quartz is dark blue and glassy in appearance, and sho gold occasionally. One man is employed. John Canyon, of Murp owner.

*San Guiseppe Mine* (Quartz).—See our VIIIth, Xth, and XI Reports, pp. 654, 740, and 306. It is ½ mile W. of Sonora. The v occurs in amphibolite-schist altered from diorite-porphyrite. The qua contains no free gold, it being wholly associated with iron sulphide a tellurium. The shaft is 215′ deep, and sinking is in progress. Sev men are employed. Fred Sutton, of Sonora, owner.

*Santa Maria Mine* (Quartz).—It is near Crockers, 20 miles S.E. Groveland. The vein is from 6″ to 8′ wide, and is heavily sulphuret The formation is granite. The development consists of a cross-c tunnel and drifts along the vein. Two men are employed. John Neale et al., of Sonora, owners.

*Santa Ysabel Mines* (Quartz).—This property is on the south end Quartz Mountain, at 1,500′ elevation, and comprises the claims forme known as the *Gray Eagle*, *Knox & Boyle*, *Miller & Holmes*, and *Nym* See our Xth and XIIth Reports, pp. 51 and 304. There is considera development on the property, which was made years ago. More recent three new shafts have been sunk; No. 1, the most southerly, is 250′ de No. 2, on the Miller & Holmes, is 360′ deep, and No. 3, on the Knox Boyle, is sunk 600′ from a station cut in an adit level driven from t south side of the hill. There are extensive cross-cuts and drifts r from each of these shafts. A drift south from No. 3 shaft will connect wi the other shafts at the 300′ level. An electric plant was installed in t summer of 1895, the dynamo being placed on Woods Creek, and t power transmitted to the several hoists. It having been demonstrat that the water-supply is not to be depended upon, an auxiliary stea plant has been installed, with another generator at the mines. T electric motors have given entire satisfaction thus far. Sixty-two m are employed. Santa Ysabel Mining Co., of Boston, Mass., own B. M. Newcomb, of Stent, superintendent.

*Sarah Francis Mine* (Quartz).—See Peña Blanco.

*Saratoga Mine* (Quartz).—See our XIIth Report, p. 306. Worked f pockets. Six men are employed. J. T. Faxon, of Sonora, owner.

*Sell Mine* (Quartz).—It is a pocket mine, on the west slope of Ba Mountain, ½ mile N.E. of Sonora. Four men are employed. Jo Bachich, of Sonora, owner.

*eminole Mine* (Quartz).—This property is 1 mile S. of Carters, and prises the *Buckeye, Georgia, Mayflower, Lena Belle, Seminole,* and *ng America* claims, which are located on a vein or lode having a heasterly strike, and presumably joining the Consolidated Eureka near the Lady Washington Mine. The Seminole is the principal m, and is opened by an incline 200′ deep, connecting with an adit s-cut at 100′ from the surface. Levels have been run on the vein, some stoping done. The quartz is crushed in a 10-stamp mill. er than the Mayflower the remaining claims have only superficial elopment. Eighteen men are employed. Consolidated Seminole ing Co., of New York, owner; J. L. Coles, of Carters, superintendent.

*hanghai Mine* (Quartz).—It is on Yankee Hill, 3½ miles E. of umbia. The only information obtainable is that in early days a it was sunk to an unknown depth. It is now being reopened and a stantial hoisting plant erected. Five men are employed. P. Mor-, of Columbia, owner.

*hawmut Mine* (Quartz).—See Eagle. It is 2½ miles N.W. of Jackson-e. A cross-cut has been driven on the Shawmut, 1,125′ from Woods ek, crossing the vein, the face still being in ankerite. Drifting south ow in progress. Twenty-one men are employed. Rosenfield & Hal-owners; A. Halsey, of Chinese Camp, superintendent.

*ilken Mine* (Quartz).—See our XIIth Report, p. 306. It is 1 mile . of Priests Hill. Idle. C. P. Hale, of Big Oak Flat, owner.

*ilver Star Mine* (Quartz).—It is a new claim, lying east of the Mam-h, ¾ mile N.E. of Jacksonville. It has only superficial development. I. Russell, of Jacksonville, owner.

*ilver Star Mine* (Quartz).—It is a prospect on Big Oak Flat, and is ned by a tunnel 65′ in length. H. Yerkin, of Big Oak Flat, owner.

*kinner Mine* (Quartz).—It is a prospect, 1 mile S.E. of Jacksonville. rriman & Oliver, of Sonora, owners.

*ilver Queen Mine* (Quartz).—It is on Yankee Hill, 3½ miles E. of umbia. The vein is 3′ wide. George Mapes, of Sonora, owner.

*nell Mine* (Quartz).—See our XIth Report, p. 505. It is between e Creek and the Stanislaus River, 7 miles E. of Murphy, and 13 es N. of Columbia. There are two veins or pay-shoots, which over-at the ends, and are about 10′ apart. They are joined diagonally by oss vein. There are two shafts, 100′ and 75′ deep, respectively, which connected underground by a drift and raise. The veins are from 1′ 8′ wide. A winze is sunk below the 100′ level, but the air in the e was so bad that no examination could safely be made. Formerly rtz was hauled a long distance from the mine to an arrastra and shed, but lately the rock extracted has been piled on the dump, and a ge quantity has accumulated. There are only trails in these mount-is at present, which is a drawback to the more rapid development of section. Two men are employed. Estate of Col. Dorsey, of San ncisco, owner.

*onorita Mine* (Quartz).—It is near Arrastraville. The vein is 20″ le. It has a 10-stamp water-power mill. Sonora Extension Mining , of Sonora, owner.

*onora Extension Mine* (Quartz).—See Rising Sun.

*oulsby Mines* (Quartz).—See our VIth (Part II), Xth, and XIIth eports, pp. 59, 742, and 306. They are at Soulsbyville, and comprise *Churchill, Johnson & Bradbury, Pennsylvania, Platt & Gilson,* and

*Soulsby* mines. The formation is grano-diorite, mica-schist, and trusive dikes of diorite and felsitic rock. The principal mine is Soulsby, which has been worked 800′ in depth. The quartz usua carries quite a large percentage of sulphides of iron, copper, lead, a zinc, containing gold. Pyrrhotite is also of common occurrence. vein, about 2′ wide, is high-grade. It has been idle some years, but recently sold, and the purchasers have already made important coveries on reopening and sinking in the old Pennsylvania shaft, a a new hoist is being erected. Twelve men are employed. Willi Sharwood, of Soulsbyville, superintendent.

*Spring Gulch Mine* (Quartz).—It is between Big Cañon and North Fork of Tuolumne River, 2½ miles S.E. of Carters. It ha shaft reported to be 400′ deep. The workings are now caved. It wa one time equipped with a hoisting plant and 10-stamp mill, both which burned. W. Marshall, of Sonora, owner.

*Stanley Mine* (Quartz).—See our XIth Report, p. 510. It is on Kan Creek, 1 mile S.E. of Jacksonville. It has a tunnel and open cut. gold-bearing zone is in amphibolite-schist. There is a 10-stamp mill the mine. Idle. Thomas Whitto, of Sonora, owner.

*Star Mine* (Quartz).—It is 18 miles N.E. of Sonora, near Rose Cre and is an old mine being reopened. The main shaft is 170′ deep. Th is in the aggregate 1,400′ of shafts, tunnels, raises, etc., on the mi The vein is in slate, a few hundred feet from a large granite mass. new 10-stamp mill is being built. The quartz is usually heavily s phuretted, carrying sulphides of iron, lead, zinc, and copper, and of visible gold. The mill will be equipped with both steam and wa power. For the latter a pressure of 510′ is available. The property situated in a heavy belt of timber. Seventeen men are employ Rose Creek Milling Co., of San Francisco, owner; F. W. Wilmans, Columbia, superintendent.

*Stenchfield Mine* (Quartz).—See Karrington.

*Stewart Mine* (Quartz).—It is ½ mile E. of Sonora, and is worked pockets. Three men are employed. Mr. Stewart et al., of Sono owners.

*Stockton Mine* (Quartz).—It is ½ mile S. of Sonora, and is a pock mine that has been worked extensively. It has recently been equipp with a new hoisting and pumping plant, and an incline sunk 200′ the vein. Three men are employed. R. B. Lane and W. C. Oaks, Sonora, owners.

*Street Mine* (Quartz).—It is ½ mile N. of Tuttletown, near Jacks Flat, and has been opened by several shallow shafts. It has a 6-stan mill. Four men were employed in August, 1896. Fred Sutton, Sonora, owner.

*Sugarman* (*Sophia*) *Mine* (Quartz).—See our Xth Report, p. 737. is 1 mile N.E. of Sonora, on Bald Mountain. It is a pocket mi producing crystallized gold of great beauty. Two men are employe John Neale, of Sonora, owner.

*Sullivan Mine* (Quartz).—It is 4 miles N. of Groveland, joining t Godfrey Mine. A shaft has been sunk 30′ on the vein. Two men a employed. Sullivan Bros., of Groveland, owners.

*Sweeney Mine* (Quartz).—It is ¼ mile N. of Quartz Mountain, and h a shaft 200′ deep, but no machinery. Howard Preston, of Jamestow owner.

*werer Mine* (Quartz).—It is at Tuttletown, and is worked for pockets. ross-cut tunnel is being driven to connect with the old workings, and l be 250′ in length. Three men are employed. Mrs. William Swerer, Tuttletown, owner.

*Tanzy Mine* (Quartz).—It is on the Bonanza vein, in Sonora. Three n are employed. Cuneo & Oneto, of Sonora, owners.

*Tarantula Mine* (Quartz).—It is 1 mile S.W. of Tuttletown and 2 es N. of Table Mountain. It has a 4′x 10′ shaft, which is 80′ deep. e. E. C. Frisbee, of Sonora, owner.

*Thompson Mine* (Quartz).—It is a pocket mine, ½ mile S. of Big Oak t. The formation is mica-schist, intruded by diorite dikes. Two n are employed. Hall & Harten, of Big Oak Flat, lessees.

*Toledo Mine* (Quartz).—It is 1½ miles W. of Tuttletown, and was at time worked successfully. The quartz contains mispickel. More ently a hoist was erected and a shaft sunk 100′, but the machinery s too light to sink deeper and hoist the water, and the mine is idle in. W. B. Clements, of Tuttletown, owner.

*Trio Mine* (Quartz).—See our Xth Report, p. 53. It is 1¼ miles N.W. Jamestown. It has a massive cropping of quartz and ankerite. A nnel has been driven obliquely in this mass, cross-cutting a vein 35′ ie. A. Hayward, of San Francisco, owner.

*Urquhardt Mines* (Quartz).—This group is 6 miles N.E. of Groveland, l consists of thirteen claims, of which the Mexican is the only one ving any development. A 50′ shaft has been sunk on a 4′ vein. The maining claims have only surface cuts. Joseph Urquhardt, of Grove- d, owner.

*Utopia Mine* (Quartz).—It is a prospect, 1¼ miles S.W. of Tuttletown. s. Rikert, of Sonora, owner.

*Valparaiso Mine* (Quartz).—It is 1 mile N. of Tuttletown, near the nislaus River. It was worked years ago, and then abandoned. A v tunnel is now being driven into the mountain which will be 759′ m the surface when under the old workings. Six men are employed. lliam Krouse, of Tuttletown, owner.

*Violet Mine* (Quartz).—It is on the North Fork of Tuolumne River. e vein is 2′ to 3′ wide. Neale & Carter, of Sonora, owners.

*Virginia Mine* (Quartz).—See Argall.

*Virginia Mine* (Quartz).—See Garfield-Virginia.

*Vulture* (*Donovan*) *Mine* (Quartz).—It is 1 mile N. of Quartz Mount- . A cross-cut tunnel 100′ long cuts through a vein of quartz and kerite 25′ wide. Idle. Mrs. Donovan et al., of Jamestown, owners.

*Waterman Mines* (Quartz).—They are 2 miles N.W. of Big Oak Flat, d are pocket mines which have quite extensive superficial develop- nt. Two men are employed. A. Waterman, of Groveland, owner.

*Watson Mine* (Quartz).—It is on the Watson ranch, 5 miles N.E. of oveland, and has a 40′ shaft on a 4′ vein of quartz. Two men are ployed. Edward Watson, of Groveland, owner.

*Wheal Perrin Mine* (Quartz).—It is at Soulsbyville, joining the Soulsby ne. It has a shaft 80′ deep. William Glasson, of Sonora, owner.

*Wheal Ruff Mine* (Quartz).—It is ½ mile W. of Soulsbyville, on the no road. It has a shaft 110′ deep on a vein 1½′ wide, which carries a h-grade sulphuretted ore. Thomas Richards, of Sonora, owner.

*Wheeler Mine* (Quartz).—It is a pocket mine, ½ mile N.E. of Big Oak lat. O. Fisk, of Coulterville, Mariposa County, owner.

*White Oak Mine* (Quartz).—See Black Oak.

*Whitto* (*Draper*) *Mine* (Quartz).—It is 1 mile W. of Soulsbyville, granite. It has a 300′ inclined shaft, now caved. Thomas Whitto, Sonora, owner.

*Wildcat Mine* (Quartz).—It is at Big Oak Flat. A tunnel has be driven 100′ on the vein. Harper & Harten, of Groveland, owners.

*Willietta Mine* (Quartz).—See our Xth Report, p. 47. It is 1 m S.E. of Jacksonville. Owned in Scotland; William Sharwood, Soulsbyville, agent.

*Winchester Mine* (Drift).—It is in the northern outskirts of Columb Idle. Miss Julia Winchester, of Columbia, owner.

*Winnie* (*Harris, Dorsey*) *Mine* (Quartz).—It is 1¾ miles N.W. Quartz Mountain, and is a portion of the Crystalline property. It h a massive outcrop, in which a large shaft is being sunk. Four men a employed. Rapp & Shafer, of San Francisco, owners.

*Wooten Mine* (Quartz).—It is on the north side of Big Oak Flat, joi ing the Mack Mine on the south. It was formerly operated through shaft now caved. D. F. Longfellow, of Big Oak Flat, owner.

*Worcester Mine* (Quartz).—It is ½ mile N. of Tuttletown, and is pocket mine, in amphibolite-schist. It is opened by a series of sha from 15′ to 55′ in depth, besides surface cuts, underground drifts, e One man is employed. H. O. Gibson, of Tuttletown, owner.

*Worcester Mine* (Quartz).—It is 1½ miles S.W. of Carters, and between the *Buckeye* and *Georgia* claims, of the *Seminole* group. The is a 90′ shaft and a steam hoist on the mine, but no mill. Idle. T. Winwood, of Sonora, owner.

*Yancy Mine* (Quartz).—It is a pocket mine, 1 mile N.E. of Sono Two men are employed. Mr. Yancy, of Sonora, owner.

*Young America Mine* (Quartz).—See Seminole Group.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| App & Heslep | Water | 40 | 850 | | | | | | | |
| Basin | Steam | 5 | | | | | | | | |
| Belleview | Steam | 10 | 850 | 20 | 4 | | | | | 400 sq. ft. |
| Black Oak | S. & W. | 10 | 850 | 20 | 4 | | | | | |
| Bonanza | Water | 2 | 850 | 5 | | | | | | |
| Buchanan | Steam | 10 | 850 | | | | | | | |
| Buzzard's Roost | Water | 5 | | | | | | | | |
| Clio | | 10 | 750 | | | | | | | |
| Con. Eureka (Dead Horse) | S. & W. | 20 | 750 | 40 | 8 | Frue | | | | |
| Conlin & Graham | Steam | 4 | 700 | | | | | | | |
| Dutch | Steam | 5 | 850 | 10 | | | | | | No data. |
| Experimental Gulch | Water | 10 | 650 | 25 | | | | | | |
| Fischer | Water | 5 | 750 | | | | | | | |
| Gem | Water | 10 | 650 | 10 | | | | | | |
| Golden Gate | Water | 20 | 850 | 50 | 8 | Frue | 1 | 2 tons. | | 3,200 sq. ft. |
| Golden Rule | Water | 10 | 800 | 12 | | | | | | |
| Hammilfield | Water | 10 | 900 | 23 | | | | | | No data. |
| Joe Hooker | Water | 5 | | | | | | | | |
| Jumper | Water | 10 | 950 | 20 | | | | | | |
| Kanaka | Water | 10 | 750 | 20 | | | | | | |
| Keltz | Water | 15 | 850 | 30 | 3 | Woodbury | | | | |
| Knox & Boyle | | 10 | (Will build | larger | mill) | | | | | |
| Laura and North Star | Water | 10 | 850 | | | | | | | |
| Little Gem | Water | 10 | 850 | 30 | | | | | | |
| Mammoth | Water | 10 | | | | | | | | |
| Madrid | Water | 5 | 650 | 7½ | | | | | | |
| Mississippi | Steam | 10 | 750 | | | | | | | |
| Mount Zion | Water | 5 | 750 | | | | | | | |
| New Albany | Water | 10 | | | | | | | | |
| Noonday | | 5 | | | | | | | | |
| Ohio | Steam | 5 | 700 | | | | | | | |
| Patterson | | 10 | (Falling | down) | | | | | | |
| Peña Blanco | Steam | 5 | 850 | 12 | | | | | | |
| Rawhide* | Elect. | 40 | 850 | 70 | 16 | Frue | 1 | 5 tons. | | |
| Republican | Water | 5 | 750 | | | | | | | |

*Only 20 stamps running.

MILLS IN TUOLUMNE COUNTY—Continued.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Riverside | | 20 | 750 | | | | | | | |
| Seeber | Water | 15 | 750 | 40 | | | | | | |
| Seminole | Water | 10 | 850 | | | | | | | |
| Sonorita | Water | 10 | | | | | | | | |
| Soulsby | Water | 15 | 750 | | | | | | | |
| Stanley | Water | 10 | 850 | | | | | | | |
| Star | S. & W. | 10 | 900 | 20 | 4 | U. I. Works | | | | |
| Street | Steam | 6 | 700 | | | | | | | |
| Willietta (mill dismantled) | | | | | | | | | | |

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN TUOLUMNE COUNTY.

| Name of Mill or Mine. | Power. | Number. | Character. | Diameter. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Gloster | | | Arrastra | | | | | | | | |
| Ritchie | Water | | Arrastra | | 1 | | | | | | |

## Ventura County.

*Bunker Hill Mine* (Quartz).—See our XIIth Report, p. 314. It is on the western slope of Frazer Mountain, 15 miles W. of Gorman, at about 6,000′ altitude. Idle until recently. Three men are employed. Hayes Bros., of Ventura, owners.

*Castac Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 683 and 315. It is on Piru River, in the Snowy District, about 10 miles S. of Gorman. The mill was burned in May, 1895. Idle. A. Frazier, of Gorman, owner.

*Fairview Mine* (Quartz).—See our XIIth Report, p. 315. It is on the east side of Frazer Mountain, and adjoins the Bunker Hill. Idle. Aylock & Read, of Gorman, owners.

*Foley (Esperanza) Mine* (Quartz).—It is on the western part of Frazer Mountain, 18 miles W. of Gorman, at 6,200′ altitude. The developments consist of shallow cuts and two shafts, 20′ and 40′ deep. Three men are employed. John Foley, of Gorman, owner.

*Frazer Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 682 and 315. It is on the southern slope of Frazer Mountain, 6 miles W. of Gorman, at about 7,000′ altitude. The workings consist of 2,200′ of tunneling, and since our last Report more systematic mining has been carried on. The old mill, burned in August, 1894, has been replaced by a 10-stamp mill and a 3½′ Huntington mill. Pine timber is abundant. There is only enough water to run the mill half-time during summer. The ore is said to average 8% sulphurets, which are worked by the cyanide process. Eighteen men are employed. Frazer Mining Co., owner; J. D. Bicknell, of Los Angeles, president; G. F. Conant, of Los Angeles, secretary; W. W. James, of Gorman, superintendent.

*White Mule Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 682 and 316. It is near the Fairview, on the western part of Frazer Mountain, at 6,500′ altitude. Idle.

There are numerous other idle claims in the Frazer Mountain District, on which more or less development has been done.

## MILLS IN VENTURA COUNTY.

| Name of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Character. | No. | Capacity. | | |
| Frazer* | Steam | 10 | 850 | 33 | 2 | Gilt Edge | | | 25 tons. | |

In addition to stamps, the mill marked with a * have additional crushing capacity, as noted in the following list:

## ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN VENTURA COUNTY.

| Name of Mill or Mine. | Power. | Number | Character. | Diameter | Capacity per 24 Hrs., in Tons. | Concentrators. | | Furnaces. | | Cyanide Plant, Daily Capacity. | Canvas Table, Size. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | No. | Character. | No. | Capacity. | | |
| Foley | | | Arrastra | | | | | | | | |
| Frazer | | 1 | Huntington | 3½′ | | | | | | | |

## Yuba County.

The important industries of the valley region of the county are agriculture, horticulture, and stock-raising. Hops are extensively grown about Wheatland. The sugar-beet industry is contemplated, and it is said a sugar factory will soon be erected. The lands are well watered, both by stream and subterranean supply. The soils of the lowlands are deep and fertile. Bricks are burned intermittently near Marysville and Wheatland, from superficial deposits of sandy clay, to supply local demands. Natural gas escapes from water wells at Marysville, but is not used.

*Beehive Mine* (Quartz).—See Mount Hope.

*Boa Mine* (Quartz).—It is situated in Timbuctoo, at 650′ elevation, and consists of three claims consolidated. The vein is 3½′ wide in the bottom of the workings, courses N.W., and dips 53° W., in slate. It is being developed through two shafts; one is 66′ in depth and the other, a new 4′x6′ shaft, is now 41′ deep. The quartz carries 2% of sulphurets; no plant on the mine. Four men are employed. An incorporated company, owner; R. H. Dailey, of No. 216 Post Street, San Francisco, secretary; G. E. Mowath, of Smartsville, superintendent.

*Blue Point Mine* (Placer).—See our XIIth Report, p. 317. It is ¼ mile E. from Smartsville, at about 550′ elevation. Idle. P. Campbell, of Smartsville, owner.

*Brandy Creek Mine* (Placer).—See our XIIth Report, p. 318. It is 2 miles N.W. of Camptonville, and comprises 6,500′ by 600′. — Stevens et al., of Camptonville, owners.

*Burns Mine* (Quartz).—It is ¾ mile N.E. of Smartsville, at 500′ elevation. The 3′ vein trends N.W., and dips N.E., between slate walls. It is opened by shaft and tunnel. The former is 50′ deep on the pitch of the vein, while the tunnel is 200′ in length. Assessment work only. J. Burns, of Smartsville, owner.

*Chandler Mine* (Quartz).—See our XIIth Report, p. 318. It is situated 2 miles S. of Brown's Valley P. O., and contains 160 acres of patented land. Idle. J. Lafferty, of Brown's Valley, owner.

*Cleopatra Mine* (Quartz).—It is ½ mile N.E. from Smartsville, at 600′ elevation. The 2½′ vein trends N.W. and S.E., and dips S.W. A 22′ incline has been sunk on the vein. Assessment work only. Excelsior Water and Mining Co., of Smartsville, owner; Mr. Hallsted, of Smartsville, manager.

*Dakota Mine* (Quartz).—See our XIIth Report, p. 318. It is 1½ miles N.W. from Brownsville, at 2,600′ elevation. J. C. Campbell and T. A. Dawley, of Brownsville, owners.

*Dannebrog Mine* (Quartz).—See our Xth and XIIth Reports, pp. 798 and 318. It is situated on the outskirts of the town of Brown's Valley, at 250′ elevation. Since our last Report the mine has passed under the control of parties who have placed a boiler and No. 10 Hooker pump at the shaft, and are pumping out the mine to resume active work. The former workings extended to a depth of 600′. N. D. Rideout et al., of Marysville, owners; J. C. Campbell, of Brown's Valley, superintendent.

*Deadwood Mine* (Quartz).—It is 2½ miles from Forbestown, near the Butte County line, at 2,660′ elevation. The vein, 5′ to 9′ wide, strikes N.E., and dips S.E., in a greenstone formation. The quartz is well

mineralized. Several shallow shafts have been sunk, but the mine idle. Mrs. Miller, of Forbestown, owner.

*Delaware Mine* (Quartz).—See our XIIth Report, p. 318. It i miles S.E. of Brownsville, and is an extension of the Eagle Mi Enoch Bros., of Dobbins Ranch, owners.

*Eagle Gold Mine* (Quartz).—See our XIIth Report, p. 318. It i miles S.E. from Brownsville; near the Indiana Ranch. Idle. L. Wil and J. Rodgers, of Dobbins Ranch, owners.

*Excelsior Water and Mining Co.'s Mine* (Hydraulic).—See our XI Report, p. 319. Its mining ground lies about ¼ mile E. of Smartsvi and extends to Mooney's Flat, at 550′ elevation. Not working; company rents water for mining and irrigating. Dr. Ayer's heirs Boston, Mass., owners; Mr. Hallsted, of Smartsville, superintendent.

*Flag Mine* (Quartz).—See Old Flag.

*Golden Gate Mine* (Quartz).—See our XIIth Report, p. 319. It i mile S. of Woodville, near the Butte County line, at 3,475′ elevation, a comprises one claim of 1,500′ by 600′. The vein strikes N.E. and S.W., granite, but has not been reached by the three cross-cuts, of which longest is 80′. One man is at work. S. Thurston and A. L. Murp of Forbestown, owners.

*Golden Mary Mine* (Quartz).—See our XIIth Report, p. 319. I situated 1 mile S.W. of Brownsville, in Sec. 34, T. 19 N., R. 6 H. L. Clark and T. Cobain, of Brownsville, owners.

*Good Hope Mine* (Quartz).—See our Xth Report, p. 320. It is ¾ m from Cabbage Patch, 10 miles E. of Wheatland. The mine and 4-sta steam mill are idle. R. Vincent et al., of Grass Valley, Nevada Coun owners.

*Good Title* (*Templar*) *Mine* (Quartz).—See our XIIth Report, p. 3 It is situated 14 miles S.W. from Camptonville, at 2,300′ elevation. T vein, varying from 16″ to 13′ in width, trends N.W. and S.E., and dips N.E. between syenite walls. The quartz carries 1% sulphurets of hi grade. The mine has been idle for some time, but is being reope with a lower tunnel, as the water drove them out of the former workin which consisted of a 250′ cross-cut tunnel to the vein, with 400′ of dri thereon, and a shallow winze. There is a 4-stamp steam-power m with two Frue concentrators. Four men are at work. J. J. Dailey, Dobbins Creek P.O., owner.

*Hawkeye Mine* (Quartz).—It is situated in the town of Brown's Vall at 250′ elevation. The 1,500′ by 600′ claim contains a vein, 18″ to wide, trending N.E. and S.W., and dipping 35° S.E., with a greenst foot-wall. Besides free gold, the quartz carries some sulphurets. T vein has been worked along the outcrop by open cuts, and the rich of the ore crushed in the hand-mortar. Two men are at work. Bart Bros., of Brown's Valley, owners.

*Hibbert & Burris Mine* (Quartz).—See our Xth and XIIth Repo pp. 798 and 320. It is in Sec. 16, T. 16 N., R. 5 E., ¼ mile N.W. Brown's Valley, at 250′ elevation. Idle. Hibbert & Burris, of Brow Valley, owners.

*Higgins Mine* (Quartz).—It is 14 miles S.W. from Camptonvil at 2,300′ elevation. The vein, from 1′ to 9′ in width, carries ½% s phurets, trends N.E., and dips nearly vertically, in a syenitic formati The developments consist of an open cut and considerable stripping the apex of the vein. A 5-stamp water-power mill is in course of er

in; 400 inches of water are to be taken from Indiana Creek through mile of 3′x3′ ditch. Eight men are at work. J. Rogers et al., of Dobbins Ranch P. O., owners.

*Honeycomb Mine* (Quartz).—See our XIIth Report, p. 321. It is on Willow Creek, 1½ miles W. of Camptonville. M. Malloch, of Marysville, secretary.

*Jefferson Mine* (Quartz).—See our XIIth Report, p. 321. It is situated in the south end of the town of Brown's Valley, at 250′ elevation. Idle. An incorporated company, owner; G. Harvey, of Marysville, secretary.

*Johnson Mine* (Quartz).—See our XIIth Report, p. 321. It is 3 miles N. of Brownsville, in Sec. 28, T. 19 N., R. 6 E. H. A. Conwell, of Brownsville, owner.

*Last Chance Mine* (Quartz).—It is 3 miles N.E. of Spenceville, at 850′ elevation, and produces gold and copper. Idle. D. O. Mills et al., of New York, owners.

*Marc Anthony Mine* (Quartz).—It is ¾ mile N.E. from Timbuctoo, at 2′ elevation. The vein strikes N.W. in slate, and dips S.W. Only assessment work done. It has a 70′ incline, tapped by a tunnel; also the remains of an old 10-stamp mill, driven by a 16′ overshot waterwheel. An incorporated company, of Marysville, owner; M. Havy, of Hartsville, superintendent.

*Mosquito Mine* (Placer).—See our XIIth Report, p. 321. It is situated on the Indiana Ranch, 6 miles S.E. from Brownsville, at 2,400′ approximate elevation, and consists of 80 acres. C. E. Morey, of Dobbins Ranch P. O., owners.

*Mount Hope Mining and Milling Co.'s* (*Beehive*) *Mine* (Quartz).—See our XIIth Report, p. 317. It is on the line between Butte and Yuba counties, 2 miles S. of Woodville, and comprises two claims. The former workings are being cleaned out, and a drain tunnel, now 180′ long, is being run to tap the shaft, which is 175′ deep. The 10-stamp steam-power mill, with 750-lb. stamps, is idle. Ten men are employed. Thomas Applegarth, of New York, secretary; George Roberts, of Forbestown, Butte County, superintendent.

*New Era Gravel Mining Co.'s Mine* (Placer).—This property is situated 1½ miles S.E. of Brown's Valley, at 200′ approximate elevation, and comprises 240 acres along the Yuba River. The company has placed a dredger in the river for working the accumulated tailings and original gravel. The dredger is 65′ long, 20½′ beam, and is supplied with 27 buckets attached to a frame (ladder), which can be lowered to the bottom through a slot in the center of the bow of the boat. Seven buckets is equivalent to one cubic yard. The loaded buckets are raised above the upper deck and dumped automatically on a grizzly placed above and in front of a carrier amidship, which travels toward, and dumps the rocks over, the stern. The material which passes through the grizzly drops into a chute leading to a line of sluices, 76′ long, parallel with, but on a lower level than, the carrier. The sluices, lined with slat riffles, are supplied with quicksilver, and dump over the stern of the boat. One and a half cubic yards of material is raised per minute. The water for washing the gravel in the sluices is raised from the river through a well, placed amidship, by means of a centrifugal pump, geared to throw a steady stream of 75 miner's inches, but which can be increased to 160 miner's inches. The machinery is driven by an 80

H.P. engine, supplied with steam from a locomotive boiler. A sa clutch provides for stopping the dredging machinery instantly in ca accidents to the buckets. The entire machinery weighs 80,000 lbs. boat has a draught of 27″. It requires 4 men to run the dredger. incorporated company, owner; J. Toplitz, of No. 330 Pine Street, Francisco, secretary; T. J. Hibbert, of Brown's Valley, superintend

*Ohio Flat Mining Co.'s Mine* (Hydraulic).—It is 2½ miles S.E. f Forbestown, at 2,500′ elevation, and comprises an agricultural pat Five acres have been worked, and about four remain to be worked. bank is from 16′ to 25′ high, with from 2′ to 3′ of gravel next to granite bedrock. The Forbestown ditch supplies 180 miner's inche water for the giant and elevator, which raises the debris 20′; the through 500′ of 2′x3½′ flume, dumping onto Nevada Flat. Eight are employed. Thomas Little et al., of Forbestown, owners.

*Old Flag* (*Flag*) *Mine* (Quartz).—It is ¾ mile N. of Brown's Va P. O., at 280′ elevation, and consists of two locations, with two ve the principal one varies from 10″ to 4′ in width, courses N.W., and 35° S.W., with an extremely hard greenstone foot-wall and well-def gouge. The quartz is of ribbon structure, rather glassy, carries co free gold and 1½% to 2% high-grade sulphurets, including lead, iron, and copper. A 5′x10′ incline shaft has been sunk 200′ deep, whe station is being completed, prior to continuing the shaft to the 400′ l At 150′ a drift has been run over 200′ N. and a short distance S. F the stopes over the N. drift, and which extend to the surface, the pre supply of milling rock is being taken. The hoist is run by a 30 engine, and the 8″ Cornish plunger pump by a 40 H.P. engine; s the mine does not make much water. The ore is being hauled ½ mi the Hibbard & Burris 5-stamp mill, until the company's 10-stamp has been erected. This mill crushes 7½ tons per day, through a N screen, and saves the concentrates on a Union concentrator. Fee and rock-breaking are done by hand. Twenty-two men are emplo An incorporated company, owner; F. L. Olmstead, of No. 315 Montgor Street, San Francisco, secretary; A. H. Walrath, of Brown's Va superintendent.

*Old Pittsburg Mine* (Drift).—See our XIIth Report, p. 321. It miles N.W. of Camptonville, and comprises 18 acres on an old cha F. W. Haley et al., of Camptonville, owners.

*Rattlesnake Mine* (Quartz).—See our XIIth Report, p. 322. It mile N. of Brown's Valley. Idle. Cabalier & Co., of Brown's Va owners.

*R. C. Mine* (Quartz).—See our XIIth Report, p. 322. It is ¼ mi of Brownsville. Reuben Clark, of Monticello, owner.

*Slag Mine* (Quartz).—See our XIIth Report, p. 322. It is ¾ mi of Brown's Valley. Thomas Gotman, of Brown's Valley, owner.

*Sweet Vengeance Mine* (Quartz).—See our XIIth Report, p. 322 is 1½ miles N. of Brown's Valley.

*Templar No. 3 Mine* (Quartz).—See Good Title Mine.

*York Mining Co.'s Mine* (Hydraulic).—See our XIIth Report, p. It is on New York House Flat, 1½ miles W. of Challenge. H. A. well et al., of Brownsville, owners.

MILLS IN YUBA COUNTY.

| me of Mill or Mine. | Power. | Number of Stamps. | Weight of Each, in Lbs. | Capacity per 24 Hrs., in Tons. | Concentrators. | |
|---|---|---|---|---|---|---|
| | | | | | No. | Character. |
| d Title | Steam | 4 | 650 | | 2 | Frue. |
| gins | Water | 5 | 750 | 6 | | |
| rc Anthony | | 10 | | | | |
| unt Hope | Steam | 10 | 750 | | | |
| Flag | Steam | 5 | 850 | 7½ | 1 | Union. |

# GYPSUM.

## Fresno County.

Gypsum occurs in many places in the foothills skirting the west side San Joaquin Valley, and has been mined intermittently, being used a fertilizer for alkali soils. Only 600 tons, valued at $4,800, was ned in 1895.

*Coalinga Mine.*—See our XIIth Report and Bulletin No. 3, pp. 323 d 63. It is 9 miles N. of Coalinga, at about 1,500′ altitude. The ll is at Coalinga. Idle. Coalinga Gypsum and Fertilizing Co., of salia, owner.

*Paoli Mine.*—See our XIIth Report, p. 323. It is on the ridge border- g the San Joaquin Valley, 4 miles S. of Hayes, and Big Panoche eek, at about 1,200′ altitude. Idle. Paoli Gypsum Mining Co., owner; H. Hall, of Selma, manager.

*San Joaquin Valley Mine.*—It is 4 miles N.W. of Coalinga, in Sec. T. 21 S., R. 14 E., at about 1,000′ altitude. The gypsum occurs in connected bunches and of various grades, overlying the coal forma- n, and dips N.E. It is principally mixed with clay and sand. A nited quantity has been used as a fertilizer, and if properly selected ore could be mined suitable for that purpose. San Joaquin Valley al Co., owner; E. Kauntz, of Hanford, superintendent.

## Kings County.

*E. D. Jones Mine.*—It is in Kettlemen Valley, in the N.W. ¼ of c. 13, T. 24 S., R. 17 E., in the southwestern part of the county, at out 425′ altitude. It is worked intermittently. The gypsum is ound and used as a fertilizer. Samples have been selected which are id to be 94% pure, but the rock is generally poorer. The developments e two small open cuts. Impure gypsum outcrops in places over 80 res. Two men are employed when the mine is being worked.

### Los Angeles County.

*Alpine Plaster Company.*—See our XIIth Report, p. 324. T quarries are situated 1 mile S. of Palmdale. The works are at Alame and Washington streets, Los Angeles. The products are wall-plast land-plaster, and plaster of Paris. Four men are employed in t quarry and five at the works in Los Angeles. S. W. Holsinger, of N 317 E. Third Street, Los Angeles, superintendent.

### San Benito County.

*Bitterwater Deposit.*—It is on a hill, on the west side of Bitterwa Valley, 12 miles N.E. of King City, at about 1,900′ altitude. It is a gr compact rock, 5′ thick, dips gently westward, is overlaid by soil, a outcrops in places over an area of about 500 acres. It is said to be su able for land-plaster, and a limited quantity has been ground in S José and sold for that purpose. Idle. S. Lyons, of Bitterwater, a Dunn Bros., owners.

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## IRON.

### Del Norte County.

*Magnetite* occurs in the serpentine near Gasquet, associated wi copper and iron sulphurets.

*Hematite* is found in the northern part of the county in such quanti and quality to make it valuable for smelting. No developments. T mountains east of Gasquet, French Hill, and the slopes of Hardscrabb Creek are covered with grains and lumps of brightly polished bla hematite, which seems to have weathered out of the serpentine count rock.

### Humboldt County.

*Centerville.*—See our XIIth Report, p. 326, where this valuable depo is described. Idle.

### Napa County.

Iron is found at the head of Sulphur Creek, and also in Conn Valle but is not utilized. See our XIIth Report, p. 327.

### Shasta County.

*Lost Confidence Mine.*—See our XIIth Report, p. 327. It covers acres, near Slick Rock Creek.

*Maxwell Mine.*—See our XIIth Report, p. 327. It is 1¾ miles E. of t McCloud River hatchery.

*Potter Mine.*—See our XIIth Report, p. 327. It is 1½ miles E. of t U. S. hatchery, on the McCloud River.

# MAGNESITE.

## Fresno County.

A 10′ ledge of hard white magnesite is said to exist on Kings River, 4 miles below Mill Creek, in Sec. 5, T. 13 S., R. 24 E.

## Napa County.

*Berthenia Mine.*—See our XIIth Report, p. 328. This is in Soda Cañon, 12 miles E. of Rutherford. About 300 tons of rock was shipped from this mine in 1895, all in the natural state. It was taken from the outcroppings of the vein and from bowlders found on the surface. S. H. Holmater, of Chiles, owner.

*Snowflake Mine.*—See our XIIth Report, p. 328. It lies in Chiles Valley, 10 miles E. of Rutherford. There are four tunnels, from 80′ to 100′ long, driven in the vein, which is about 3½′ wide. To save freight charges the rock is calcined in an ordinary limekiln, and shipped in sacks to San Francisco. About 8 tons are treated per day. W. T. Bartlett, of St. Helena, owner.

## Santa Clara County.

Magnesite occurs in numerous places in serpentine in the mountainous region of the eastern part of the county, the greater part of which is too far from shipping facilities to be of economic importance at present.

*Cochran's, Mrs. A. F., Quarry.*—It is on Coyote Creek, 4 miles E. of Madrone, at about 600′ elevation, and is worked intermittently. Pacific Rolling Mills, of San Francisco, lessee.

*Red Mountain Deposits.*—See our XIth and XIIth Reports, pp. 374 and 328. A number of outcrops of magnesite occur on the slopes of Red Mountain, in the northeastern part of the county, and a number of claims have been taken up. On account of the great distance from market they have been temporarily abandoned. There is a large outcrop in Sec. 18, T. 6 S., R. 5 E., on the south side of the mountain, at about 3,500′ elevation.

## Tulare County.

A large deposit of magnesite is said to exist in T. 19 S., R. 35 E. Not developed.

# MANGANESE.

## Alameda County.

About 600 tons was produced in 1895 in this county, and is prin pally used in gold chlorination works. It occurs in bunch-like depos in the southeastern part of the county, and in many places the sha are impregnated with it. It varies greatly in character, and requi careful assorting to obtain the proper grade of ore.

*Bartlett Mine.*—See our XIth and XIIth Reports, pp. 121 and 3 It is in Mitchell Cañon, in Sec. 6, T. 4 S., R. 4 E., 15 miles S.E. of Liv more. Idle. H. H. Pitcher, of Livermore, owner.

*Estacio's, B. F., Mine.*—See our XIIth Report, p. 329. It is on t Cedar Mountain road, 8 miles S.E. of Livermore. Idle.

*Hearst's, J. W., Mine.*—It is in Sec. 30, T. 4 S., R. 4 E. It is a n prospect, and is not sufficiently developed to determine the extent the ore. Three men are employed in developing.

*Mendenhall's, O. W., Mine.*—See our XIIth Report, p. 329. It is ½ m S. of Cedar Mountain road, and 11 miles S.E. of Livermore. Idle.

*Mendenhall's, O. W., Corral Hollow Mine.*—It is on the steep easte slope of Corral Hollow, about 14 miles S.E. of Livermore. The occurs in jaspery shales, which dip 45° to 60° E. About 200 tons good ore has been mined near the surface. Two men are employ J. W. Merchant, of Livermore, lessee.

*Merchant's, J. W., Mine.*—See our XIIth Report, p. 329. It is on t Arroyo Mocha Valley road, in Sec. 21, T. 4 S., R. 3 E., 11 miles S.E. Livermore. About 200 tons of good ore has been mined near the su face. Idle.

*Overacker's, H. T., Mine.*—It is a small prospect in the Arroyo Moc Cañon, 12 miles S.E. of Livermore. Manganese impregnates the shal and a limited quantity of good ore has been obtained. One man is e ployed.

*Taylor & Pitcher's Mine.*—See our XIIth Report, p. 329. It is on t east side of Corral Hollow, 15 miles S.E. of Livermore. About 300 to of good ore is said to have been mined. Idle. Taylor & Pitcher, Livermore, owners.

## Del Norte County.

*Psilomelane* is reported to exist in the northern part of the county a large body. Not visited.

## Marin County.

A variety of manganese ores are found on the Mailliard ranch, miles W. of San Rafael. See our XIIth Report, p. 329.

## San Joaquin County.

*. Caire's Mine.*—See our Xth Report, p. 564. It is on the south side Corral Hollow, 10 miles S.W. of Tracy, at 900′ altitude. The ore is a vein-like deposit, in bunches, more or less connected, running N.W. arenaceous shale and jasper. It is worked intermittently, and 280 s were mined in 1895. The workings consist of a tunnel about 600′ g, and a number of stopes. J. Caire, of San Francisco, owner.

## Santa Clara County.

*DeForest Deposit.*—A bunch-like deposit occurs in Sec. 12, T. 7 S., 4 E., in a ravine, 3 miles S. of DeForest, at 2,500′ elevation. It is developed, and said to contain 57% metallic manganese.

*Faville's, R., Deposit.*—See our XIth Report, p. 374. It is in Sec. T. 5 S., R. 4 E., 25 miles S.E. of Livermore, at 2,900′ elevation. e outcrop is high-grade ore, samples of which are said to assay 72% oxide of manganese. Undeveloped.

*Penitentia Creek.*—See our XIIth Report, p. 330. It is a large owlder on Penitentia Creek, in Alum Rock Park. The ore is of fair ade, and probably came from a bunch-like deposit up the stream.

## Sonoma County.

*Shaw's Mine.*—See our XIIth Report, p. 330. It lies on the ridge 7 iles N.W. of Cloverdale. The top of a small hill seems to consist irely of pyrolusite. An open cut, 6′ deep, is made through it, d about 60 tons of 65% to 75% ore lies on the dump. Idle. J. E. aw, of Cloverdale, owner.

# MINERAL SPRINGS.

## Alameda County.

*Meyhew's Sulphur.*—It is in an orange orchard, 600′ N. of N Station. The water is strongly sulphuretted, and said to possess imp tant medicinal properties. H. A. Meyhew, of Niles, owner.

*Piedmont White Sulphur.*—See our XIIth Report, p. 331, for ana sis. They are 3 miles N.E. of Oakland.

*Warm.*—They are 2 miles N.E. of Warm Springs Station. Th flow a large quantity of water with a temperature of 94° F., and wh is charged with sulphur and other minerals. The place was forme a popular resort, but is now private grounds and the hotel is not ope to the public. Josiah Stanford, of Warm Springs, owner.

## Alpine County.

*Grover Hot.*—They are situated 4 miles W. of Markleeville, on mountain flanking the Middle Fork of the Carson River, at 6,0 elevation. The water varies in temperature from 90° to 110° F., and charged with gas. The smallest spring flows 1,600 and the larg 15,000 gals. daily. Several mounds, about 50′ high and 500′ acr have been formed from the sediment deposited from the waters. Ba ing facilities have been provided and are well patronized. Mrs. H. Grover, of Markleeville, owner.

## Butte County.

*Mount Ida.*—They are situated on the olive farm of Hon. John Gray, 4 miles E. of Oroville, and flow about 2 miner's inches. Acco ing to analysis made by M. E. Jaffa and Geo. E. Colby, the wa contains:

| | Grains in One Gallon. |
|---|---|
| Silica | 2.07 |
| Potassium sulphate | 3.24 |
| Sodium sulphate (Glauber's salts) | 18.73 |
| Sodium bicarbonate | 1.12 |
| Sodium chloride (salt) | 8.52 |
| Lithia (with spectroscope) | Strong. |
| Calcium carbonate | 8.79 |
| Calcium sulphate (gypsum) | 2.57 |
| Strontia (with spectroscope) | Strong. |
| Magnesium carbonate | 2.85 |
| Iron carbonate | 0.70 |
| Manganese carbonate | Traces. |
| Boracic acid (with spectroscope) | Strong. |
| Organic matter | Traces. |
| Total | 48.59 |
| Free carbonic acid gas per gallon | 27.4 |
| Temperature | 65° F. |

More than $6,000 worth was bottled and sold during 1895.

## Colusa County.

*Blank's Sulphur.*—They are on Sulphur Creek, in Sec. 29, T. 14 N., R 5 W., 27 miles S.W. of Williams, at about 1,900′ elevation. The water is strongly sulphuretted, has a temperature of 108° F., and is highly recommended for medicinal purposes. The improvements consist of a small, comfortable hotel, bath-houses, etc. Mrs. Lottie Blank, on Sulphur Creek, owner.

*Cook's.*—This group is in a narrow cañon on the west side of Indian Valley, in Sec. 9, T. 16 N., R. 6 W., 20 miles W. of Sites, by road, and at about 1,900′ elevation. The four important springs flow a small quantity each. The water is charged with sulphur, carbonic acid gas, carbonates of soda, magnesia, iron, and calcium, and has a temperature of 60° to 70° F. About 10,000 gals. are shipped annually; is used locally for medicinal purposes. The improvements are a small hotel, cottages, etc., for the accommodation of a limited number of guests. Young, Vance & Co., owners; Charles Young, of Leesville, manager.

*Fouts'.*—They are in Sec. 5, T. 17 N., R. 7 W., about 35 miles N.W. of Sites, by road. There are said to be five springs in the group, which have a small flow each. The small hotel will accommodate a limited number of guests; the place is also used as a camping resort. John F. Fouts, of Stony Ford P. O., owner.

*Wilbur.*—For analysis see our XIIth Report, p. 331. They are on Sulphur Creek, 25 miles S.W. of Williams, at about 1,800′ elevation, and have a strong flow of highly mineralized water with a temperature of 140° F.; locally used for medicinal purposes. John M. Moore, of San José, owner; Wm. Oeldart and A. G. Smith, of Sulphur Creek P. O., lessees.

## Contra Costa County.

*Alhambra Mineral.*—They are in a narrow cañon in Sec. 2, T. 1 N., R 3 W., about 5 miles S.W. of Martinez, at about 550′ elevation. There are two important springs; one of which flows 700 gals. daily. The water is strongly sulphuretted, and is used for bathing purposes. The following analysis is by Prof. E. W. Hilgard, of Berkeley:

| | Grains per Gallon. | Parts in 10,000. |
|---|---|---|
| Silium sulphate, potassium sulphate, etc. | 57.12 | 9.78 |
| Silium carbonate (sal soda) | 6.19 | 1.06 |
| Silium chloride (common salt) | 399.77 | 68.44 |
| Calcium chloride | 182.13 | 31.18 |
| Calcium sulphate; calcium and magnesium carbonates | 5.37 | 0.92 |
| Magnesium chloride | 8.65 | 1.48 |
| Silica | 0.46 | 0.08 |
| Organic matter, very small | | |
| Totals | 659.69 | 112.94 |

The water from the other one is bottled at the spring, and charged with natural carbonic acid gas from New Almaden. About 15,000 gals. are sold annually for drinking purposes. This spring flows about 2,900 gals. daily. Its water has been recently put on the market, and the demand is said to be rapidly growing. The water comes up through

shales, which dip at a steep angle. Alhambra Mineral Springs C owner; D. J. West, of Martinez, secretary; Dr. O. G. Merrell, of Mar nez, lessee.

*Byron.*—See our VIIIth and XIIth Reports, pp. 163 and 331, for co of analyses, etc. They are in a small valley near the foothills on t eastern border of the San Joaquin Valley, 1½ miles from Byron Static There are seven important springs that are improved, and numero less important and unimproved ones. The waters principally come through sandy adobe clay, which fills the valley. Natural gas is al obtained from shallow borings at the springs, and preparations are bei made to utilize it for heating and illuminating purposes. The wate have temperatures of 50° to 140° F.; are strongly mineralized, and ha a wide reputation for medicinal purposes. They are said to be effic cious in cases of rheumatism, neuralgia, liver, kidney, stomach, ski and many other diseases. They are well improved, with comfortab hotel and bathing accommodations, etc. L. R. Mead, secretary Risd Iron Works, San Francisco, owner; A. Bettens, of Byron, superinten ent.

## Fresno County.

*Fresno Hot.*—See our Xth Report, p. 189. They are on Hot Spri Creek, a tributary to Warthen Creek, 15 miles W. of Alcalde, at abo 1,800′ altitude. The waters are said to have temperatures of 80° to 11 F., and are much used locally for medicinal purposes. Kreyenhage Bros., owners; A. M. Barker, of Alcalde, manager.

*Mercy.*—They are in Little Panoche Valley, in the northwest corn of the county, 25 miles S. of Los Baños. Used locally for medicin purposes. John J. Mercy, of Llanada, San Benito County, owner.

## Humboldt County.

*Cook's.*—This is on North Yager Creek, 35 miles E. of Eureka. It a spring containing sulphur and iron. F. W. Cook, of Iaqua, owner.

*Felt's.*—See our XIIth Report, p. 333. They are 5½ miles N.E. Fortuna.

*Humboldt Artesian Mineral Water Co.*—For analysis see our XIIt Report, p. 333. Its well is on the edge of the bay, just S. of Eurek The bottled product in 1895 amounted to 24,000 gals.

*Mountain View.*—It is on Mad River, 28 miles E. of Eureka. It is small spring smelling strongly of sulphuretted hydrogen, and value for medicinal purposes. Archie McBride, of Kneeland, owner.

*Yager Creek.*—Quite a number of mineral springs exist on the hea waters of this stream and on the ridge between it and Mad River. N improvements are made on any of them, although they are said to be great medicinal value.

## Inyo County.

*Coso Hot.*—They lie in the desert, 15 miles E. of Little Lake, and 3 miles S. of Keeler. The main spring is intensely hot. A number c steam vents in the vicinity deposit a yellowish mass, containing sul phur, which has a sour, astringent taste. Half a mile west of the mai spring is another and smaller one, and here the ground is covered wit

icious sinter and quartz in separate minute crystals, with here and ere a small quantity of pyrite; no doubt a precipitate from the hot ter. To the east, a short distance, a large area is covered with native lphur, derived, probably, from the same source. Judge A. V. David- a, of Independence, owner.

## Lake County.

It is a mountainous county, lying in the Coast Range, 80 miles N. San Francisco. It derives its name from Clear Lake, whose area is 0 square miles or more in extent. It occupies the center of a large tile depression between two principal mountain ridges of the Coast ange. A number of mineral springs are found in the county, and any of them are used as sanitary resorts during the summer. Among e minerals, quicksilver takes the lead, and there are several large ines in the southern part of the county. Gold, silver, copper, sul- ur, borax, and asbestos also occur, but are not mined at present.

*Adams.*—For analysis see our VIIIth Report, p. 327.

*Allen.*—For analysis see our XIIth Report, p. 334.

*Anderson.*—For analysis see our XIIth Report, p. 335.

*Bartlett.*—For analysis see our XIIth Report, p. 335.

*Bonanza.*—They lie between Howard and Ziegler springs, in a seques- red spot on the side of the mountain, at about 2,500′ elevation. They e 2 miles from Ziegler, 6 miles from Glenbrook, and 8 miles from ower Lake.

*Harbin.*—For analysis see our XIIth Report, p. 336.

*Highland.*—They are 15 miles W. of Pieta, on the S. F. & N. P. R. R., about 1,700′ elevation, and are about 30 in number.

### Analysis of Five of the Springs.

By W. B. Rising, Professor of Chemistry, University of California, June 2, 1882.

| ames of springs | SELTZER. | DUTCH OR EMS. | MAGIC. | NEPTUNE. | DIANA. |
|---|---|---|---|---|---|
| emperature | 64.8° F. | 70.5° F. | 82.4° F. | 81.7° F. | 84.4° F. |
| | Grains per Imperial gallon. | | | | |
| hloride of sodium | 0.723 | 1.862 | 1.290 | 1.680 | 1.899 |
| icarbonate of soda | 12.796 | 18.348 | 21.763 | 22.100 | 24.080 |
| icarbonate of potash | 0.489 | 0.770 | 0.544 | 0.803 | 1.466 |
| icarbonate of lime | 52.045 | 57.302 | 50.411 | 77.750 | 73.270 |
| icarbonate of magnesia | 34.872 | 67.634 | 70.243 | 89.870 | 78.950 |
| icarbonate of iron | 1.267 | 1.344 | 1.087 | 1.370 | 1.400 |
| icarbonate of manganese | Trace. | Trace. | Trace. | Trace. | Trace. |
| ilica | 5.245 | 7.126 | 7.398 | 8.420 | 8.079 |
| lumina | 1.565 | 0.117 | 0.169 | 1.370 | 0.230 |
| rganic matter | Trace. | Trace. | Trace. | Trace. | Trace. |
| icarbonate of baryta | ------ | ------ | ------ | 0.175 | 0.200 |
| icarbonate of lithia | ------ | ------ | ------ | Trace. | Trace. |
| oracic acid | ------ | ------ | ------ | .470 | Undet. |
| ree carbonic acid | 100.250 | 87.822 | 74.462 | 94.120 | 71.850 |
| Totals | 209.252 | 242.325 | 227.367 | 298.128 | 261.424 |

*Howard.*—For analysis see our XIIth Report, p. 337.

*Mills.*—See our VIIIth Report, p. 328.

*Saratoga.*—See our VIIIth Report, p. 328.

*Seigler.*—See our VIIIth Report, p. 328.

*Witter.*—For analysis see our XIIth Report, p. 337.

## Lassen County.

*Big Hot.*—Three miles north of Honey Lake.
*Brenbeck's.*—On the east side of Honey Lake; alkaline; boiling.
*High Rock.*—Nine miles east of Honey Lake; alkaline; 100° F.
*Mud Springs.*—Fifteen miles northeast of Honey Lake; hot; alkaline.
*Shafer's Hot.*—At north end of Henry Lake, containing hot (210° F.) solution of salts and sulphurets.

## Marin County.

*El Toro.*—For analysis see our XIth Report, p. 251. It lies on Taylor's ranch, near Novato.
*Rocky Point Hot Sulphur.*—Fully described in our XIth Report, p. 250–251. They lie on the beach below high-water mark, 8 miles S.E. of Bolinas.

## Mendocino County.

*California Seltzer.*—For analysis see our XIIth Report, p. 333. They are 12 miles from Cloverdale.
*Duncan's Mineral.*—See our XIIth Report, p. 338. They are situated 1½ miles S.W. of Hopeland Station. There are seven springs; the principal ones are known as the borax, the two sodas, the sulphur, and the Duncan Spring, of which the last is the largest. The following analysis was furnished us by O. Howell, of Hopeland, the owner:

DUNCAN'S SPRING.

| | Grains per Gallon. |
|---|---|
| Bicarbonate of magnesia | 90.11 |
| Chloride of magnesium | 1.41 |
| Sulphate of magnesia | 1.64 |
| Bicarbonate of lime | 15.64 |
| Silica | 6.94 |
| Bicarbonate of potash | 2.37 |
| Bicarbonate of soda | 2.37 |
| Free carbonic acid | 36.57 |

*Garby's.*—It lies at the base of the foothills, 1 mile W. of Ukiah, and is a small, alkaline spring, highly prized by invalids. It is not improved. Mr. Garby, of Ukiah, owner.
*Lane's.*—It is in Redwood Valley, near Calpella. It has an alkaline, but pleasant taste. No improvements. Thomas Lane, of Calpella, owner.
*Orr's Hot.*—These three springs are in a narrow cañon of the South Fork of Big River, 14 miles N.W. of Ukiah, at 1,000′ altitude, and are named the *Cold Sulphur*, the *Hot Sulphur*, and the *Iron Spring*. The Hot Sulphur Spring has a temperature of 106° F., and the water is strongly impregnated with sulphur, etc. The baths are highly efficient for rheumatism and constitutional diseases. The bath-houses are near the spring in the cañon, and the grounds are tastefully arranged,

th a view to furnish shade and comfort to visitors. The following alysis was furnished us by the manager:

Hot Sulphur Spring.

| | |
|---|---|
| Silica | 1.917 |
| Silicate of soda | 15.502 |
| Oxide of calcium | 0.425 |
| Carbonate of lime | 0.367 |
| Carbonate of soda | 0.175 |
| Chloride of sodium | 1.909 |

rr Estate, owner; J. L. Orr, of Orr, manager.

*Vichy.*—For analysis see our XIIth Report, p. 338. They are 3 miles .E. of Ukiah.

## Mono County.

*Buckeye Hot.*—The five springs are on Buckeye Creek, 7 miles W. of ridgeport, at 7,000′ elevation. The flow is about 3,000 gals. daily, and a temperature of 80° to 100° F. Used locally for bathing. C. E. eath, of Bridgeport, owner.

*Fales' Hot.*—They are situated at the junction of the Antelope and onora toll-roads, 14 miles W. of Bridgeport, at about 7,600′ elevation. he flow is great, and the water ranges in temperature from 100° to 180°. It is quite a popular place of resort, and much esteemed for medicial purposes. Good bathing facilities. A. S. Fales, of Bridgeport, wner.

## Monterey County.

*Bane's Soda.*—See our XIIth Report, p. 340. It is about 6 miles .W. of the Cruikshank Mine. Unimproved. J. W. Bane, owner.

*Dolan's Hot Sulphur.*—See our XIIth Report, p. 340. It is on the orth Fork of Big Creek, 1½ miles from the coast. P. Dolan, of Sur, wner.

*Helm's Soda.*—See our XIIth Report, p. 340. They are 3 miles E. of ane's Springs, at 1,600′ elevation. Unimproved. B. F. Munsa, of imeon, owner.

*Paraiso.*—See our XIIth Report, p. 340. They are 7 miles S.W. of oledad, in a mountain recess, at 1,500′ altitude. The waters of the hree important springs are used for medicinal purposes, both by drinkng and bathing. They are said to be efficacious in cases of gout, heumatism, liver and kidney diseases, etc. The temperature of the ater of the "soda spring" is 118° F., and of "sulphur spring," 105° F. he following analysis of the water from soda spring was made by rof. Hilgard, of Berkeley, in 1893:

| | Grains per Gallon. |
|---|---|
| Organic matter | 5.25 |
| Silica | 2.62 |
| Alumina and iron | 1.60 |
| Potassium chloride | 0.35 |
| Sodium chloride | 3.50 |
| Soda sulphate | 35.50 |
| Soda carbonate | 4.23 |
| Lime sulphate | 4.32 |
| Lime carbonate | 1.43 |
| Total | 58.80 |

The rocks which outcrop near the springs are a granulite, compo
principally of quartz, mica, and iron. Well improved for accommo
tion of guests. W. W. and Mary A. Ford, owners; R. Roberts,
manager.

*Slate's Hot Sulphur.*—See our VIIIth and XIIth Reports, pp. 411 a
341. They issue from bluffs facing the coast. Unimproved. Mr. Lit
owner.

*Tassajara.*—See our VIIIth and XIIth Reports, pp. 411 and 3
They are in a deep cañon, tributary to the Arroyo Seco, 50 miles S.
Salinas, by road, and about the same distance from Monterey, at 1,6
altitude. The waters are said to be efficacious in cases of rheumatis
stomach, liver, kidney, and cutaneous diseases. A small hotel and ba
house constitute the improvements. The following copy of analy
was furnished by the manager. Each Imperial gallon contains
grains of mineral constituents, as follows:

| | Per Cent. |
|---|---|
| Sulphate of soda | 15.04 |
| Sulphate of magnesia | 13.17 |
| Sulphate of lithia | 3.10 |
| Silica acid | 8.50 |
| Organic matter | 18.00 |
| Carbonic acid | 22.46 |
| Potash | 1.45 |
| Sulphuric acid | 2.41 |
| Hydrogen and sulphur | 3.00 |
| Alumina | 3.87 |
| Sesquioxide of iron | 7.08 |
| Iodine | 0.75 |
| Arsenious acid | 1.08 |
| Bromine | 0.09 |
| Total | 100.00 |

C. W. Quilty, of San José, owner; Henry Arnold, of Salinas, manag

## Napa County.

*Calistoga.*—See analysis in our VIIIth Report, p. 416. They are n
and east of Calistoga. Hot sulphur-water can be had by boring in a
around Calistoga. The water, which is much hotter than the boili
point below the surface, seems to contain quicksilver in the form
vapor, which is precipitated near the surface, where the water coo
The clay in and around the springs is impregnated in this way w
very fine globules of mercury. The springs are deserted. Leland Sta
ford Estate, owner.

*Etna.*—See analysis in our VIIIth Report, p. 416. They lie at t
head of Pope Valley, 16 miles N.E. of St. Helena.

*Napa Soda.*—See analysis in our VIIIth Report, p. 416. They lie
the mountain side, 6 miles E. of Napa.

*Samuels' Soda.*—See analysis in our XIIth Report, p. 341. They
20 miles E. of St. Helena, in a narrow cañon.

*White Sulphur.*—They lie 2½ miles S.W. of St. Helena, and consist
9 springs, with a temperature from 69° to 142° F. The waters are lig
sulphuretted, and alkaline, and much extolled by many.

ANALYSES OF WHITE SULPHUR SPRINGS.

Analyses Nos. 2, 6, and 7, by Prof. Le Conte, in 1871. Analyses Nos. 5 and 9, by Dr. W. derson, in 1888.

| Ingredients. | Grains in U. S. Gallon. | | | | |
|---|---|---|---|---|---|
| | No. 2. Temperature, 89.6° F. | No. 5. Temperature, 77.2° F. | No. 6. Temperature, 86° F. | No. 7. Temperature, 69.8° F. | No. 9. Temperature, 69° F. |
| dium chloride | 21.72 | 22.36 | 23.41 | 14.23 | 11.91 |
| dium carbonate | | 0.09 | | | 2.14 |
| dium sulphate | 8.26 | 10.60 | 11.33 | 12.84 | 7.15 |
| gnesium chloride | 0.87 | 1.41 | 2.22 | 0.65 | 0.45 |
| gnesium carbonate | 0.62 | 0.75 | 0.56 | 4.36 | 2.70 |
| lcium chloride | 1.32 | 0.93 | 0.86 | 0.78 | 0.35 |
| lcium carbonate | 1.25 | 1.87 | 2.45 | 5.56 | 5.82 |
| lcium sulphide | | 0.53 | | | Trace. |
| dium sulphide | 2.65 | 0.76 | 1.85 | 1.62 | Trace. |
| umina | | 0.23 | | | 0.62 |
| ica | | 0.62 | | | 1.43 |
| ganic matter | | Trace. | | | Trace. |
| Total solids | 36.69 | 40.15 | 42.68 | 40.04 | 32.57 |
| ecific gravity | 1.00026 | 1.00038 | 1.00040 | 1.00038 | 1.00023 |
| lphuretted hydrogen gas | 6.15 cu. in. | 5.19 cu in. | 4.25 cu. in. | Trace. | Trace. |

## Plumas County.

Sulphurous and alkaline springs, both hot and cold, are scattered roughout the county, but, aside from local use, little importance taches to them. See our XIIth Report, p. 342.

*Arlington.*—They are on the road between Crescent Mills and Taylorsille. The waters are chalybeate, and contain also magnesia and soda. hey are used locally, and are said to be beneficial in dyspepsia.

*Battle Creek (Dr. Soupan's).*—On a branch of Battle Creek are hot ulphur springs. Near the head of Battle Creek are several hot soda prings, with heavy flows, and with a temperature from 196° to 200° F.

*Boiling Lakes.*—See our XIIth Report, p. 342. Situated near Lassen eak is a boiling lake containing thick, grayish-white, intensely hot ater; also three large boiling springs, 20′ in diameter, ejecting water n a cone; in one case 15″ to 20″, and in the other from 4′ to 6′ high.

*Chipps.*—On Chipps Creek is a large soda spring.

*Cold Soda Lake.*—This is near the head of Mill and Battle creeks, outh of Lassen Peak. The water is sparkling, cool, and palatable.

*Hot Sulphur Spring Ranch.*—This is on the Mohawk Valley road, and as several hot sulphur springs, used locally for bathing.

*Humbug Valley*—A large soda spring is situated here, and is used a ood deal by camping parties.

*Lake Cañon.*—South of the lake are alkaline springs, with a temperaure of 85° F.

*Indian Valley.*—At the west end, near the edge of Greenville, is a boilng hot spring, used locally for bathing in cases of rheumatism.

*Warner Creek.*—Near its mouth are a number of small geysers, with emperature near the boiling-point, and emitting sulphurous vapors and team.

*Willow Creek.*—At its mouth are numerous small geysers.

## San Benito County.

*Anderson's San Benito.*—It is 4 miles S.E. of Hollister, at about 30' altitude. The water is used locally for medicinal purposes, and a limited quantity is bottled. It is said to flow 6,000 gals. per day. The following analysis is by Prof. Jaffa, of Berkeley, Cal.:

| | Grains per Gallon. |
|---|---|
| Sodium and potassium sulphates | 62.99 |
| Sodium chloride | 54.56 |
| Sodium carbonate | 8.67 |
| Calcium carbonate | 3.86 |
| Calcium sulphate | 0.54 |
| Magnesium carbonate, etc. | 3.70 |
| Iron carbonate | 1.07 |
| Silica, organic matter, and chemically combined water | 10.97 |
| Total | 146.36 |

E. J. Anderson, of Tres Pinos, manager.

## San Luis Obispo County.

*El Paso Robles.*—For analysis see our XIIth Report, p. 344. They are at the town of Paso Robles, on the S. P. R. R., in the Salinas Valley, 216 miles S. of San Francisco, at about 730' altitude. They are widely known for their medicinal qualities, and the place is an elegantly improved health and pleasure resort. D. W. James, of Paso Robles, owner; — Burns, of Paso Robles, manager.

*Kessler's.*—It is at the "onyx" quarry, 16 miles N.E. of Arroyo Grande, at about 1,800' altitude. The water is very strongly charged with minerals, which form a heavy deposit about the spring. It is a strong purgative, said to be effective as a wash for curing cutaneous diseases, and flows about 600 gals. per day. Unimproved. J. & F. Kessler, of San Francisco, owners.

*Newman's Arroyo Grande Warm.*—They are in Sec. 23, T. 32 S., R. 13 E., at about 400' altitude, in a narrow valley, tributary to Arroyo Grande River, 14 miles S. of San Luis Obispo, and 2½ miles E. of Arroyo Grande. The waters are saline-sulphuretted, and are recommended for rheumatism, catarrh, dropsy, liver, kidney, stomach, and cutaneous diseases, etc. The following analysis is by Dr. Winslow Anderson:

| Temperature of water, 100.5° F. | Grains in U. S. Gallon. |
|---|---|
| Sodium chloride | 4.10 |
| Sodium carbonate | 1.75 |
| Sodium sulphate | 3.92 |
| Potassium carbonate | 0.15 |
| Potassium sulphate | 2.90 |
| Magnesium carbonate | 6.41 |
| Magnesium sulphate | 2.47 |
| Calcium carbonate | 8.25 |
| Calcium sulphate | 0.76 |
| Ferrous carbonate | 3.98 |
| Alumina | 0.33 |
| Silica | 2.03 |
| Organic matter | 0.27 |
| Total | 37.32 |
| Free carbonic anhydride | 14.90 cu. in. |
| Free sulphuretted hydrogen | 3.56 cu. in. |

*Santa Ysabel.*—They are 2½ miles S.E. of Paso Robles, at 1,000′ altitude. Analysis of waters is given in our XIIth Report, p. 344.

*Sycamore Hot Sulphur.*—See our Xth Report, p. 577. This health and pleasure resort is on the San Luis Creek, 7 miles S.W. from San Luis Obispo, at about 35′ altitude. The "spring" is a well, bored in 1885-87, which is 8″ in diameter, 935′ deep, and said to flow 144,000 gals. water and 16,800 cu. ft. gas per day. The gas is collected and used for illumination and fuel. The following analysis, made at the State University, was furnished by A. Walker, of Root, owner:

| Temperature, 103° F. | Per Cent. |
|---|---|
| Sulphuretted hydrogen gas | 6.40 |
| Free carbonic acid gas | 14.06 |
| Sulphate of lime | 4.02 |
| Sulphate of soda | 4.10 |
| Peroxide of iron | 4.06 |
| Silica | 1.60 |
| Bicarbonate of magnesia | 6.04 |
| Arsenic | 16 06 |
| Sulphur | 12.00 |
| Chloride of sodium | 9.02 |
| Iodine and bromides | 0.07 |
| Peroxide of manganese | 1.44 |
| Bicarbonate of soda | 21.00 |
| Organic matter | 0.13 |
| Total | 100.00 |

## Santa Barbara County.

*Burton Mound.*—They are in Santa Barbara, and near the beach. The water flows from a low mound in about fifteen places; the strongest of which flows 5,000 gals. daily. It is used for medicinal purposes, and is said to be efficacious in cases of rheumatism, cutaneous diseases, etc. J. Kimberley, manager.

*Cucano Hot.*—See our XIIth Report, p. 345.

*Las Cruces Hot.*—See our XIIth Report, p. 345.

*Montecito Hot.*—See our XIIth Report, p. 345.

*Mountain Glen Hot.*—See our XIIth Report, p. 345.

*Santa Barbara Hot Sulphur.*—They are in a narrow cañon facing the ocean, 6½ miles N.E. of Santa Barbara, at 1,450′ altitude. The water flows from gray sandstone in numerous places, and its temperature is 110° to 122° F. A small hotel and bath-house have been erected. These springs are recommended for rheumatism, liver, stomach, kidney, and cutaneous diseases. J. A. Kimberley, manager.

*San Marcos.*—See our XIIth Report, p. 345.

*Veronica.*—It is 3 miles W. of Santa Barbara, and affords a small quantity of mineral water, which is used locally. Veronica Mineral Water Co., owner; W. A. Hanley, of Santa Barbara, manager.

## Santa Clara County.

*Almaden (Vichy).*—See our VIIIth Report, p. 549. It is at Hacienda, 3 miles S. of San José. It has ceased flowing, and is now pumped. The quantity of contained carbonic acid gas has also decreased since the great quantity was struck in the mine. It is re-charged with gas from the mine, and bottled by the National Mineral Water Co., of San José;

24,000 gals. are said to be shipped annually. H. C. Fister, of San J
secretary.

*Alum Rock.*—For analysis see our XIIth Report, p. 345. They
in Alum Rock Park, on Penitentia Creek, 7 miles N.E. of San José
550′ elevation. There are three important springs, each of which ha
small flow. The waters are extensively used for medicinal purpo
and elegant bath-houses are provided at the springs. H. B. Alvord
San José, secretary; E. E. Munn, of San José, superintendent.

*Azule.*—It is in a narrow ravine, 1½ miles N.W. of Pacific Cong
Springs, and 13 miles W. of San José, at 900′ elevation. It is but lit
improved, and is in a region of metamorphosed shales and ferrugin
sandstones; is said to flow about 2,500 gals. daily, and 25,000 gals.
bottled and shipped per month. The following analysis is by Jam
Howden:

| | Grains per Gallon. |
|---|---|
| Free carbonic acid | 152.24 |
| Sodium chloride | 90.88 |
| Magnesium chloride | 18.48 |
| Potassium chloride | 12.44 |
| Magnesium carbonate | 77.20 |
| Sodium carbonate | 50.88 |
| Calcium carbonate | 9.00 |
| Total | 411.12 |

Azule Natural Seltzer Water Co., owner; H. C. Fister, of San J
manager.

*Coe's.*—It is on the slope of Pine Ridge, 1 mile W. of Madr
Springs, 11 miles E. of Madrone, and is unimproved. The follow
analysis is by M. E. Jaffa, Berkeley, Cal.:

| | Grains per Gallon. |
|---|---|
| Sodium and potassium sulphates ($Na_2SO_4$ and $K_2SO_4$) | 1.94 |
| Sodium chloride (NaCl) | 0.61 |
| Sodium carbonate ($Na_2CO_3$) | 5.57 |
| Calcium carbonate ($CaCO_3$) | 12.15 |
| Calcium sulphate ($CaSO_4$) | 0.41 |
| Tricalcic phosphate ($Ca_3(PO_4)_2$) | 0.65 |
| Magnesium carbonate ($MgCO_3$) | 36.80 |
| Iron carbonate ($FeCO_3$) and traces of alumina | 2.50 |
| Silica ($SiO_2$) | 5.66 |
| Organic matter and chemically combined water | 11.28 |
| Total | 77.57 |

C. & H. Coe, of Madrone, owners.

*Gilroy Hot Sulphur.*—It is 14 miles N.E. of Gilroy, at 1,450′ ele
tion. The water has a temperature of 109° to 115° F., flows ab
135,000 gals. daily, and is said to be efficacious in cases of rheumati
kidney, liver, stomach, and blood diseases. It is well improved for
accommodation of 250 guests, and is open all the year. George
Roop, of Gilroy, manager.

*Madrone.*—They are on a tributary of Coyote Creek, in a w
timbered, mountainous region, 12 miles E. of Madrone by stage r
at about 2,200′ elevation. There are four important springs, know
the *Soda*, *Iron*, *Sulphur*, and *Arsenic* springs, and numerous less
portant ones. The water of the soda spring is that most used. S
12,500 gals. are shipped annually, and considerable used at the spri
It is said to be efficacious in cases of stomach, liver, kidney, and m
rial diseases, asthma, etc. Hotel and cottages are provided for
accommodation of guests, from May 1st to November 1st. The foll

g analysis of the soda spring water is by Prof. Geo. E. Colby, State iiversity, Berkeley:

| Temperature of spring, 58°–60° F. | Grains per U. S. Gallon. |
|---|---|
| Silica | 6.34 |
| Potassium (bi) carbonate | 1.11 |
| Sodium chloride | 1.36 |
| Sodium bicarbonate | 44.43 |
| Lithium (with spectroscope) | Traces. |
| Calcium carbonate | 55.10 |
| Calcium phosphate | 0.31 |
| Barium carbonate | 0.10 |
| Strontium (with spectroscope) | Traces. |
| Magnesium carbonate | 12.84 |
| Iron carbonate | 0.56 |
| Manganese carbonate | 0.10 |
| Boracic acid | Traces. |
| Organic matter | Traces. |
| Total | 122.25 |

. G. Dyer, of Madrone, manager.

*Pacific Congress.*—See our XIIth Report, p. 345, for full analysis. ey are in Campbell Creek Cañon, 1 mile above Saratoga, and 12 miles W. of San José, at about 850′ elevation. There are three springs in e group, which have a small flow of strongly mineralized water. Conlerable gas escapes from the strongest one, which is collected in a ceiver over the spring, and used in charging the water when bottled at e springs. About 5,000 gals. are shipped annually, and considerable used at the springs for medicinal purposes. The place is a popular alth and pleasure resort, and is provided with a comfortable hotel, ttages, etc. Extensive improvements are being made. An electric ilroad is to be constructed from San José to the springs. J. F. Pfetch, Saratoga, lessee.

## Santa Cruz County.

There are a number of mineral springs, which are said to possess more less medicinal properties. They are yet unimproved, however, and ly locally known. They are said to occur toward the head of Soquel eek and in the Corralitos Valley.

*Chittenden's Sulphur.*—They are on the Chittenden ranch, near the ilroad station of that name. The waters issue from shales in six to ht places within a small area, each of which flows a small quantity water. The waters are heavily charged with sulphur, iron, and other nerals. They are locally known for their medicinal properties, and, ough they are unimproved, are visited to some extent in summer by mpers. Mr. Chittenden, owner.

## Shasta County.

*Castle Rock.*—See our XIIth Report, p. 346.

*Chalybeate.*—See our XIIth Report, p. 346.

*Hibbs' Soda.*—See our XIIth Report, p. 346.

*Lower Soda.*—See our XIIth Report, p. 346.

*Salt Springs* are found along the banks of Stinking or Salt Creek, 12 les E. of Redding.

*Sulphur Springs.*—There are several hot sulphur springs along the nks of the Sacramento River, near to, as also opposite, the mouth of

Kosk Creek at the "big bend"; the waters are of a scalding temperatu. Locally they are used for rheumatic troubles.

Between Middle Creek and Shasta are cold sulphur springs, but th are not put to any use.

## Sierra County.

*Campbell's Hot Sulphur.*—It is 1½ miles from Sierraville, at 5,0 elevation, and has five or six available springs on the place. The ma spring, with a temperature of 104° F., flows 1,000 gals. per hour; e water contains (according to Prof. Wilson, of Reno) iron, sulphur, ma nesia, etc. It is used for both drinking and bathing purposes, and s said to be beneficial for rheumatic complaints and skin diseases. Th e are tub and plunge baths, and good hotel accommodations, making ia pleasant resort. H. Pearce, of Sierraville, owner.

## Siskiyou County.

*Shasta.*—See our XIIth Report, p. 449. They are situated 4 miles N. of Dunsmuir, on the east bank of the Sacramento River; they hava flow of 20 bbls. per hour, a temperature of 51° F., and contain, acco ing to the analysis made by Prof. Walter S. Haines, M.D., solid matr in each Imperial gallon, as follows:

| | Grains. |
|---|---|
| Sodium bicarbonate | 63.420 |
| Sodium chloride | 34.353 |
| Sodium biborate | 1.628 |
| Sodium arsenate | 0.151 |
| Sodium phosphate | 0.102 |
| Sodium iodide | Traces. |
| Sodium bromide | Traces. |
| Potassium chloride | 2.133 |
| Potassium sulphate | 1.071 |
| Lithium bicarbonate | 0.013 |
| Calcium fluoride | Traces. |
| Magnesium carbonate | 84.757 |
| Iron carbonate | 1.450 |
| Manganese carbonate | 0.013 |
| Alumina | 0.334 |
| Total | 189.425 |

Carbonic acid undetermined.

The following analyses of the waters of two new springs were made y Dr. W. D. Johnston, Chemist of the State Mining Bureau, in Septemb, 1893:

| No. 1. One Imperial gallon contains: | Grains. |
|---|---|
| Silica | 2.315 |
| Calcium carbonate | 1.680 |
| Sodium carbonate | 0.970 |
| Sodium chloride | 1.330 |
| Calcium sulphate | 0.850 |
| Magnesium sulphate | 1.157 |
| Total | 8.302 |

Carbonic acid undetermined.

| No. 2. One Imperial gallon contains: | Grains. |
|---|---|
| Silica | 2.330 |
| Calcium carbonate | 1.872 |
| Sodium carbonate | 1.030 |
| Sodium chloride | 1.700 |
| Calcium sulphate | 0.980 |
| Magnesium sulphate | 1.619 |
| Total | 9.531 |

Carbonic acid undetermined.

This water is bottled extensively at the springs, and also shipped in porcelain-lined tank-cars to San Francisco, where it is placed in siphon bottles and re-charged with carbonic acid gas. Eighteen people are employed at the springs and at the works in the city. Mount Shasta Mineral Springs Co., Sixth and Berry streets, San Francisco, owner.

*Garrison.*—They lie on Beaver Creek, 15 miles N.E. of Oak Bar. There are three springs close together. One contains considerable carbon dioxide gas, and the others are strongly alkaline. No improvements. The waters are said to be a specific for constitutional complaints. J. Garrison, of Oak Bar, owner.

## Solano County.

*Tolenas.*—For analyses see our XIIth Report, p. 346. They are 5 miles N. of Suisun, at about 1,200′ elevation. The water is bottled at the springs and re-charged with the free carbon dioxide gas which escapes from the water as it flows from the spring. About 8,000 gals. are shipped annually. Tolenas Springs and Onyx Co., owner; W. H. Chittenden, of Suisun, superintendent.

*Vallejo Sulphur.*—See our XIIth Report, p. 347. It is 4 miles N.E. of Vallejo, and flows a large quantity of sulphuretted water, which is highly recommended for medicinal purposes. James Kelly et al., of Napa, owners.

## Sonoma County.

*Agua Caliente Thermal.*—See our XIth Report, p. 458.

*Agua Rica Hot Sulphur.*—See our XIIth Report, p. 347. They are 2 miles N. of Sonoma, and on the line of S. F. & N. P. R. R. They are sixteen in number, varying in temperature from the cool iron and soda water to the hot saline-sulphurous springs, registering 111.5° F. On the property also there are mud (bath) springs, whose merits are highly extolled.

ANALYSIS OF WHITE SULPHUR SPRING.

By A. AUCHIE CUNNINGHAM, F.C.S., F.I. Inst. Lond., etc., Analyst, 1895.

| | |
|---|---|
| Temperature | 111.5° F. |
| Quantity | 300,000 gals. in 24 hrs. |
| Specific gravity (at 60° F.) | 1001.8 |

| Mineral Ingredients. | One U. S. Gallon contains: Grains. |
|---|---|
| Potassium sulphate | 0.351 |
| Potassium chloride | 0.913 |
| Sodium chloride | 34.897 |
| Sodium carbonate | 2.874 |
| Lithium | Trace. |
| Calcium carbonate | 2.863 |
| Magnesium carbonate | 0.267 |
| Ferrous carbonate | 0.071 |
| Silica | 7.500 |
| Boracic acid | Trace. |
| Sulphuretted hydrogen | 0.124 |
| Organic acids | 0.099 |
| Hydrogen gas | 0.005 |
| Total | 49.964 |

Reaction slightly alkaline.

*Burn's.*—See our XIIth Report, p. 347.

*Geysers.*—See our VIIIth and Xth Reports, pp. 673 and 635.

*Lytton.*—See our VIIIth and Xth Reports, pp. 675 and 634. The springs are at Lytton Station, on the S. F. & N. P. R. R., 70 miles fr San Francisco. The company furnishes the two following analyses:

CALIFORNIA SELTZER SPRING.

| Temperature, 62° F. | Grains per U. S. Gallon. |
|---|---|
| Sodium chloride | 79.34 |
| Sodium bicarbonate | 6.29 |
| Sodium carbonate | 72.73 |
| Potassium carbonate | 3.60 |
| Magnesium bicarbonate | 13.90 |
| Magnesium sulphate | 6.75 |
| Calcium bicarbonate | 14.05 |
| Calcium sulphate | 5.03 |
| Ferrous carbonate | 2.14 |
| Alumina | 6.81 |
| Borates | 4.43 |
| Lithium | Trace. |
| Ammonia | .33 |
| Silica | 8.09 |
| Organic matter | Trace. |
| Total solids | 223.49 |
| Free carbonic acid gas | 375.60 |

GEYSER SODA SPRING.

| | Grains per U. S. Gallon. |
|---|---|
| Sodium chloride | 8.93 |
| Sodium bicarbonate | 21.16 |
| Potassium carbonate | Trace. |
| Magnesium sulphate | 1.14 |
| Ferrous carbonate | 2.09 |
| Organic matter | Trace. |
| Sodium carbonate | 4.97 |
| Sodium sulphate | 2.60 |
| Magnesium bicarbonate | 9.03 |
| Calcium carbonate | 4.90 |
| Silica | 3.75 |
| Total solids | 58.57 |

*Mark West.*—See our VIIIth Report, p. 634.
*Skaggs.*—See our VIIIth and Xth Reports, pp. 634 and 675.

## Tehama County.

*Colyear's.*—They are situated 35 miles W. of Red Bluff, at an approx mate elevation of 3,000′, and near the Tehama Chrome Mine; on locally used. J. Colyear, of Red Bluff, owner.

*Morgan's.*—They are 50 miles N.E. of Red Bluff, at an elevation about 7,000′; used locally. Mrs. Morgan, of Red Bluff, owner.

*Poison and Kid.*—They, with several sulphate of magnesia spring are situated on the Tehama County Chrome Co.'s land, 28 miles W. Red Bluff, and are used to some extent locally. A partial test of t former, by C. A. Ogden, Ph.D., shows it to contain: Sodium chlorid calcium chloride, sodium bromide, and a vegetable substance of a pea nature, not further tested, that gives the water an oily appearanc Tehama County Chrome Deposit Co., of Red Bluff, owner.

*Tuscan.*—See our Xth and XIIth Reports, pp. 693 and 347. They a situated 8 miles N.E. from Red Bluff, at an elevation of 925′, and a found issuing over an area of 10 acres, in a basin of sedimenta rocks about 600′ across an anticlinal axis surrounded by volcan bluffs. They are entirely free from surface drainage, and unite ar

ow off into Little Salt Creek. Fifty of these springs are known, t less than half this number have been improved. Although own and used for a number of years, no attempt has been made have the different springs carefully analyzed, notwithstanding fact that they appear to vary widely in their composition; ne of them evolve a large amount of carburetted hydrogen, which is ed for heating the waters for bathing purposes. The natural temrature of the springs varies from 67° F. to 94° F. The heaviest connt flow of gas issues from a spring, designated as No. 17, at the rate 20,000 cu. ft. per day. A partial analysis of the waters made in 56 by Dr. L. Lantzwert, from what is known as the Red Spring, gave lphuric, hydrochloric, and carbonic acids in combination with iron, ae, sodium, and potassium. Iodine, to the extent of 6 grains per perial gallon, and 1 grain of lithia per gallon, were also found. e springs have a saline and sulphurous taste, and show in the waters variety of colors, as black, white, milk-blue, yellow, green, and pink. ose of the springs that are chiefly in use are numbered, and faced th cement. No. 1 is used for bathing purposes; No. 7 for granulated elids; No. 8, the strongest spring, is used for throat, lung, and art trouble; No. 15 is largely Epsom salts; No. 10 is used for dney diseases. The greatest good is accomplished by the use of ese waters in severe cases of blood poison (syphilis), skin diseases, d rheumatism. The waters are used in connection with hot, ld, and mud baths. Besides a number of tub baths, a plunge sin, 30′ by 60′ and from 4′ to 13′ deep, is provided. Regular ttling works have been started; cases containing three dozen uart bottles are sold for $3 per case, or 50 cents per gallon in mijohns. Four hundred cases were shipped in 1895. There is a od hotel at the springs, which is connected by an 8-mile wagonad with Red Bluff. To obtain a constant supply of pure drinking ater, two tunnels were driven into the bluff back of and above the otel, 130′ and 180′ long, and a shaft sunk in which the water stands within 8′ of the tunnel level, and is withdrawn by siphon into two nks of 5,000 and 8,000 gals. capacity. One of these tanks is built brick and cement; the smaller one is of galvanized zinc. Through 000′ of ¾″ pipe the entire property is provided with water. E. B. albridge, of Tuscan, owner.

## Trinity County.

*Coombs.*—They are located on the west bank of Brown's Creek, on Secs. and 7, T. 30 N., R. 9 W., 21 miles from Douglas City and 28 miles om Weaverville. There are quite a number of springs, but only four e used medicinally; of these, one is designated the Black Sulphur ring, and another the White Sulphur Spring. Have not been anazed, but are known to contain sulphur, iron, soda, and lime. The waters e cold, and have a wide local reputation for their curative effect upon eumatism and venereal diseases.

## Ventura County.

*Santa Paula Sulphur.*—They are in a narrow cañon, about 6 miles N. of Santa Paula, at 900′ altitude. There are two important springs, which flow a small quantity of water, used principally for medicinal purposes. It is a popular camping resort in summer. H. H. McCutchen, of Santa Paula, manager.

*Sespe Hot.*—It is in a cañon tributary to Sespe Creek, 35 miles NW. of San Buenaventura, at 3,000′ altitude. It flows a large quantity of water, almost boiling hot, and deposits a yellowish-green sediment. It is on Government land, and can be reached only by trails.

# ]INING AND IRRIGATING CANALS, ARTESIAN WELLS, ETC.

## Alameda County.

The artesian wells in this county are principally in the vicinity of ,varado, and in the Livermore Valley, near Pleasanton. The salt ›rks in the marsh W. of Alvarado obtain their fresh water princi- ]lly from artesian wells, which are 175′ to 200′ deep. The quantity of ıter which they flow has materially decreased since the Oakland ater Co.'s wells were bored at Alvarado. There are very many wells i the cities of Alameda and Oakland from 100′ to 250′ deep, which are ]mped by windmills for domestic purposes.

*County-Road Well.*—It is on the county road in the lowland, 1¼ miles of Pleasanton. It is 7″ in diameter, 70′ deep, and flows 1″ over the sing. The strata penetrated are—

| | |
|---|---|
| Alluvial sediment | 10′ |
| Blue clay | 45′ |
| Water-bearing gravel | 15′ |

*Granger's, F. B., Well.*—It is near the railroad depot at Alvarado. It 7″ in diameter, 177′ deep, and said to flow 100,000 gals. daily. The rata penetrated are principally clay, with a thin bed of sand at a pth of 68′, and a heavy bed of water-bearing gravel in the bottom.

*Harm's, A., Well.*—It is 1¼ miles N. of Pleasanton, and is 7″ in ameter, about 70′ deep, and flows about 1″ over the casing. The rata penetrated are—

| | |
|---|---|
| Sandy loam, etc. | 10′ |
| Blue clay | 40′ |
| Sand and gravel | 20′ |

*Helwig's, P., Well.*—It is at Alvarado. It is 10″ in diameter, 252′ ep, and flows 1¼″ over the casing. The water is obtained from beds gravel, which are overlaid by impervious clays.

*Kottinger's, J., Well.*—It is in a narrow valley, ½ mile E. of Pleasanton, 50′ elevation above the town. It is 7″ in diameter, 71′ deep, and id to have flowed 4″ over the casing when completed. It now leaks rough the casing, and the flow has decreased. The strata penetrated e impervious blue clay and gravel.

*Lilienthal's, E. R., Wells.*—These two wells are on the "hop ranch," mile N. of Pleasanton. They are 7″ in diameter, 49′ and 51′ deep, id flow 2½″ and 4″ over the casings. The strata penetrated are allual sediment, clay, and gravel.

*Oakland Water Co.'s Wells.*—This company has recently bored eighteen ells immediately S. of Alvarado, laid mains to Oakland, and erected pumping-plant at Alvarado to force the water to Oakland, etc. The ells are 10″ to 20″ in diameter, 175′ to 500′ deep, and have a total flow

of 12,000,000 gals. daily. Water pipes tap the wells 8′ below the su and carry the water to the reservoir at the pumping-plant. The provided with gates, which regulate the flow of water. The wells provided with outside casings to a depth of 40′, and the interve space between the inside and outside casings is filled with cen They penetrate beds of clay, 40′ to 50′ thick, alternating with bed water-bearing sands and gravels, 4′ to 10′ thick. W. C. Beatie, of 458 Eighth Street, Oakland, secretary; William J. Dingee, of Oakl manager.

*Silva's, F., Well.*—It is 1¼ miles S.W. of Pleasanton, and is 7′ diameter, 47′ deep, and flows 14″ over the casing, which extend above the surface. The strata penetrated are—

| | |
|---|---|
| Soil | 2′ |
| Blue clay | 43′ |
| Gravel | 2′ |

## Amador County.

*Amador Canal and Mining Co.*—The source of supply, Blue La has been increased by large impounding works. The water f down the North Fork of the Mokelumne River to a point a few m E. of West Point, where it is picked up by the main line, which i wide on top, 5′ on the bottom, and 3′ deep, with a grade of 8′ per mi The capacity is 2,500 miner's inches. The main system is 42½ miles length. Used for power, placer mining, and irrigation. Blue La Water Co., owner; W. E. Proctor, of Sutter Creek, superintendent.

*Interior Development Co.*—The water is diverted from the Cosum River at a point about 4 miles N.W. from Plymouth, and delivered two main lines of ditch and flume to the hydraulic mines at Michi Bar, Sacramento County. A ditch has been constructed nearly to G and it is the intention to use the surplus water for irrigation purpo Interior Development Co., of San Francisco, owner; D. R. Thomas Michigan Bar, superintendent.

*Volcano Ditch.*—It is 35 miles long, carrying 2,000 inches of wat which is taken from Panther and Tiger creeks. This water is tributed to mines at Rancheria, Volcano, Oleta, etc. McLaughlin tate, owner; Clarence Bradshaw, of Volcano, superintendent.

## Butte County.

The valley lands of this county are noted for their extensive orcha vineyards, grain fields, etc. From near the railway westward the soi black, sandy adobe, which is easily worked and yields largely. gravel-tufa soils, known as red-lands, in the northeastern part of valley, are less productive, and poorly supplied with subterran water. Where irrigation is practiced the water is diverted from strea on the eastern side of the county, or pumped from wells in the val No large canals have been constructed, though the natural advanta are good. A large canal is projected, taking water from Feather Ri 3 miles below Oroville, and coursing westerly through Biggs, the southerly through Gridley to the "Buttes." The subterranean wa supply in most parts is almost inexhaustible, although there are flowing wells. See our XIth Report, p. 165. At Biggs water is obtai

6′ to 22′ in depth, and a second water-bearing stratum at 60′ to 100′ epth, separated by clay. At Chico water is obtained at 15′ below surface, but better water may be had at 25′ to 30′ depth. The two s of the Chico Waterworks are 30′ deep and yield, by pumping, 000 gals., without diminishing the supply appreciably. At Gridley ge supply may be obtained at 40′ to 160′ in depth.

*Cherokee Ditch.*—See Spring Valley Hydraulic Co.

*Chico V-Flume.*—It extends from Chico to the Sierra Lumber Co.'s mills in the northeastern part of the county. It has 26″ sides and out 25 miles long. It diverts water from Chico Creek, and is used transport lumber from the mills to Chico. Sierra Lumber Co., er; C. E. Tinkham, of Chico, superintendent.

*Miocene Ditch.*—It heads on the West Branch of Feather River, Magalia, and runs to Oroville. It is 36 miles long, 9′ wide on top, bottom, and 4′ deep, with an 8′ grade, and of 2,000 miner's inches acity.

*Palermo Ditch Co.*—The head of this irrigation canal is on the th Fork of Feather River. It is 8′ on top, 6′ on the bottom, and eep, with a varying grade, and a capacity of 2,200 miner's inches. entire length of the ditch and branches is 30 miles. About 1½ miles ve Oroville it empties into a reservoir, which feeds the branches. The e of the water is 12½ cents per miner's inch for twelve hours. It is used entirely for irrigation purposes. J. Boyle, of Oroville, nager.

*South Feather Water and Union Mining Co.*, usually known as the *Forbestown Ditch*, takes its water partly from Lost Creek, opposite Straw-y Valley, at 3,250′ altitude, and partly from Dry Creek. The n line from Lost Creek is 6½′ wide on the bottom for a distance of 18 es to Forbestown; thence for 12 miles it is 5′ on the bottom, with a le of 9.6′ per mile, and a capacity of 2,000 miner's inches. The line n Dry Creek extends to Wyandotte, Hanson, and Bangor. It is 20 es long, 3′ wide on the bottom, with a grade of 16′ per mile, and acity of 300 miner's inches. The charge is 10 cents per inch for nty-four hours. Four men are employed. An incorporated com-y, of No. 530 California Street, San Francisco, owner; A. Halsey, etary; H. R. Kimball, of Forbestown, superintendent.

## Calaveras County.

*Union Ditch and Flume.*—The main line is 25 miles long, 6′ wide on , 4′ on the bottom, 3′ deep, and of 1,200 miner's inches capacity. water is taken from the North Fork of Stanislaus River, and is d chiefly by the mines of the Utica-Stickle group, at Angels, after ich it is distributed to various mines of that vicinity. Hayward, ne, et al., of San Francisco, owners; C. D. Lane, superintendent.

*Mokelumne Hill and Campo Seco Ditch.*—The main canal is 35 miles g and has a capacity of 2,000 miner's inches. The size of the ditch ies with the grade. The water is diverted from the South Fork of kelumne River, and is used by various mining companies near kelumne Hill, and also by placer miners about Campo Seco, Lancha na, and Camanche. Mokelumne Hill and Campo Seco Canal and ning Co., of Mokelumne Hill, owner; Charles Prindle, superin-dent.

*Table Mountain Ditch.*—This takes water from San Antonio C and is 15 miles long. Its capacity is 500 miner's inches. The wa used in placer and drift mines near Cave City. Treat & Wylie, o Andreas, owners.

## Colusa County.

The valley lands of this county are well supplied with subterra water, which may be had by pumping. No deep borings have made to determine the possibilities of artesian wells. Water is obt in most parts of the valley at 15′ to 60′ in depth, but between the way and Sacramento River it is generally alkaline; to procure water it is necessary to penetrate deeper strata. No important i tion is carried on, but the county possesses natural advantages f See our Xth Report, p. 179.

*Central Irrigation District Canal.*—See Glenn County. When pleted this canal will irrigate a vast area in the valley region.

## Contra Costa County.

The valley lands of this county are generally well supplied with terranean water, and good wells are 20′ to 50′ deep, and furnish a supply by pumping. A narrow artesian belt, about 1½ miles long immediately east of Concord. There are eight wells in it, which a to 100′ deep, and each flows a fair-sized stream. The strata penet are blue and yellow clays.

## El Dorado County.

*California Water and Mining Co.*—The company take their wi supply of water from Pilot Creek and its tributaries, but in sur also from Little South Fork of American River, Loon Lake, Ple Lake, Bixby Lake, and the natural outflow of these lakes, k as Girly Creek. The altitude at Loon Lake is 6,200′. The main consists of 7 miles of the bed of Girly Creek, followed by 11 mil ditch, largely flume, of the following dimensions: 4½′x 30″ on a of 16′ to the mile, carrying 1,000 miner's inches; thence dropping and flowing down Pilot Creek 11 miles to a point where the trunk commences; thence from the Pilot Creek reservoir 28 miles to Ge town; portions of the line consist of parallel ditches, with a grade to the mile and a capacity of 800 miner's inches, delivered at Ge town at an elevation of 2,800′. From Georgetown, branch ditches su the surrounding country; one extends to Greenwood, a distance miles, carrying 750 miner's inches of water, and from thence to Mam Bar Junction, a further length of 5 miles. From this point it is c to Wild Goose Flat, on the North Fork of the American River, by of Pilot Hill, a distance of 20 miles; the capacity of this last bran 200 miner's inches, and of 400′ elevation at the discharge point. sides the main line, the El Dorado branch ditch starts from Pilot C at the mouth of Mutton Cañon and connects with the main ditch 7 E. of Georgetown; this branch is 20 miles long, has a grade of 16′ t mile, and a capacity of 300 miner's inches. The company has an line, which takes the water from Rock Cañon and delivers it at Ke

is 15 miles long and has a capacity of about 200 miner's inches. ditch-tenders and two office-men are employed. California Water Mining Co., owner; C. M. Fitzgerald, of Georgetown, manager.

*aggett (Fairchild) Ditch.*—It has the right to 5,000 miner's inches he waters of Rubicon River, or the South Fork of the Middle Fork he American River, together with the waters of the South Fork of Pilot ek. The first section is constructed from Volcanoville, on the Mount gory ridge, to Pilot Creek, a distance of 22 miles, with lateral ditches bout 3 miles. It is 6′ on top, 4′ on bottom, and 3′ deep, with a grade .6′ per mile and capacity of 3,000 miner's inches. At Volcanoville re is a fine reservoir. The flumes, etc., have lately been reconstructed. elevation of about 3,000′ removes all liability to obstruction from ws, while securing the benefit of the entire watershed on both s of the river; it is also sufficiently high to cover all the available iferous gravel on the Georgetown Divide. The remaining surveyed ion to be constructed is 26 miles in length, and at the point of diver- n on the Rubicon there is a steady flow at the lowest stage of 2,000 ner's inches, and for ten months in the year a superabundance of er, with a number of available reservoir sites. The Mount Gregory ge, opposite Michigan Bluff, is yet in a comparatively virgin state, l without doubt carries a large area of pay-gravel. At present the ch is supplying water to the Channel Bar Mining Co., and also to the o Channel Mining Co., of Kentucky Flat. Hon. John Daggett, of ck Bear, Siskiyou County, owner; William J. Readshaw, of George- n, superintendent.

*Diamond Ridge Ditch Co.*—This system of ditches covers an area country in El Dorado and Sacramento counties approximately 60 les E. and W., with an average width of 12 miles N. and S., at eleva- ns from 300′ to 4,100′ above the sea. The summer supply of water is erted by three main lines, with capacities of 1,000 to 1,500 miner's hes, from the North Fork of the Cosumnes River and its branches, mp and Park creeks. The winter supply is drawn from Carson, Clear, er, Indian, Ringgold, Slate, Squaw, Weber, and other smaller creeks. The High Service line, of 1,200 to 1,500 miner's inches capacity, begins the Baltic mill, 24 miles E. of Diamond Springs, on Camp Creek; nce 6¼ miles to Hazel Valley, dropping 650′ into Park Creek; thence wn Park Creek, through Hazel Valley and Sly Park reservoir sites, 2 les; thence 5½ miles to the Dry Gulch hydraulic mine. Here the ter is either dropped into Camp Creek for the Low Service line, scribed later, or down Dry Gulch 1 mile to Clear Creek; thence 15 les by the Middle Service line to Pleasant Valley, Newtown, Fort Jim, nnessee Hill, and Red Hill, where it may be dropped into Ringgold eek, down which it flows 3 miles; thence 5 miles to Diamond Springs. om Red Hill a branch line of 150 inches capacity extends 3 miles rthward to Brooke's Hill. Also, from Ringgold Creek the Sherry anch of 120 inches capacity courses 3 miles northward to Weber Creek. The Middle Service line, from Squaw and Clear creeks eastward, is in mporary disuse.

The Low Service line diverts water from the North Fork of the osumnes River, at the mouth of the Steeley Fork, 3 miles W. of rizzly Flat, and conveys it 11 miles to Camp Creek; thence 9 miles to ear Creek; thence 7 miles to the Cascade Falls, where it divides, one ortion being carried 2 miles by the Connecting line to the Middle

Service line; thence 4 miles to Baker's Hill, where it is dropped into Ringgold Creek and picked up by the High Service line, previously described. The other portion is dropped into and flows down Sc Creek 2 miles; thence 6 miles to Diamond Springs, where both sys unite. This ditch is 8′ wide on top, 6′ on the bottom, 2′ deep, w grade of 4′ per mile, and a capacity of 1,000 miner's inches.

The water flows around on the north and south sides of Dian Hill in three ditches at different elevations. The South Diamond feeds the two Waldo branch ditches and reservoirs, which supply country south of Diamond Springs; their capacity is 120 inches e At the west end of Diamond Hill the following branches, with ca ties of 100 to 200 inches, radiate, and supply the country north northwest, viz.: Gold Hill, Missouri Flat, Missouri Flat "loop," S Sugar Loaf, and North Sugar Loaf to Indian Creek; thence 6 mile the mud line to the Lone Tree reservoir; thence by smaller branch Grapevine, Mound Springs, Red Crevasse, Shirley Flat, Tennessee,

The main line drops down a ravine at the west end of Diamond and flows to the three "equalizing" reservoirs between Diamond Spr and Mud Springs, where the following branch lines, of 100 to 400 in capacity, diverge, viz.: Loafer's Hollow, 6 miles to Aurum City, Logtown, 4 miles; Lower Empire; Lower Logtown, 13 miles to I mitage, etc. The main line leaves the reservoirs and flows 3 m down Empire and Slate creeks to the falls of Slate Creek, where Rock branch starts on the north side and runs 3 miles northward. main line is diverted on the opposite side and continues via Buck Flat, Shingle Springs, Green Valley, etc., 16 miles to the Ameri reservoir, of 200 acres, at 1,400′ altitude. At Buckeye one branch north to Tennessee and Pyramid; the other goes south, through S mill Ravine, to Frenchtown, thence 3 miles by ditch to Pekin, Fino, etc. Several miles east of the American reservoir the water r be dropped into Deer Creek and picked up 5 miles lower down, n Cothrin's, and diverted by a branch extending 12 miles to the De reservoir, and thence to the Western House, 18 miles from Sacrame City. Near White Rock this line divides, and the other branch swe around the hills to Willow Springs, near Folsom. This latter bra may also be fed from the American reservoir by dropping the w down Carson Creek. From the same reservoir small branches run Clarkesville, Marble Valley, Mormon Tavern, Plunkett, Saccarap, Sweetwater. The total length of the surveyed lines is 314 miles; t part in operation just at present is about 170 miles. Peter Watt Placerville, superintendent.

*Douglas Ditch.*—See Empire.

*El Dorado Water and Deep Gravel Mining Co.*—This company ta water from the American River, at Cedar Rock, at 3,500′ elevation, miles E. of Placerville. The main canal is 40 miles long, 16′ wide top, 4′ on the bottom, 6′ deep, and with a grade of 4′ to the mile. W in good condition the capacity is 5,000 miner's inches. An old ditch, a lower elevation, owned by the company, is abandoned. The branch ten in all, extend to Gold Hill, El Dorado, South Flat, etc. The We ditch is 10 miles in length; South Fork, 16 miles long, 5′ broad, a 3′ deep; the Missouri Flat ditch is 10 miles long, 4′ on top, 2′ on b tom, and 2′ deep. The charges for water are: For sluicing, 10 ce per inch per day; for power, 15 cents per inch; for hydraulic, 6 ce

inch, and for irrigation, 10 cents per inch, all for twelve hours. The pany owns 260 acres of hydraulic mining ground on Spanish Hill, e Ravine, etc. Eleven ditch-men are employed. El Dorado Water Deep Gravel Mining Co., owner. (See Placerville Gold Quartz Min- Co.) A. D. Henderson, of Placerville, superintendent.

*mpire* (*Douglas, Plymouth*) *Ditch.*—It has its head on Middle k of the Cosumnes River, 4 miles above Pi-pi Valley, at 3,600′ alti- e. The main canal is 26 miles long, 4′ wide, 3′ deep, and has 16′ to ile grade, with 1,500 miner's inches capacity; the lateral branches nding to Cedarville, Fairplay, Bridgeport, and Bean Hill, and have a grade of 16′ to 1 mile. The *Bridgeport branch*, at an elevation of 00′, is 12 miles long, 2′ wide, 18″ deep, with a capacity of 800 miner's nes. The *Fairplay branch* is 7 miles long, 3′ wide, 2′ deep, and 500 ner's inches capacity. The *Cedarville branch* is 6 miles long, 2′ wide, deep, and carries 200 miner's inches. The *Bean Hill* has a length miles, is 2′ wide, 18″ deep, and carries 300 miner's inches. The rge for water is 8 cents per inch for twenty-four hours, for both ning and irrigating. Four ditch-tenders are employed. A. Hayward l Hobart Estate, of San Francisco, owners; J. Crane, of Plymouth, ador County, superintendent.

*Natoma Ditch.*—It is 12 miles long, taking water from American River, the head of Salmon Falls. The ditch is 10′ wide on top, 6′ on the tom, and 2½′ deep, having a grade of 4′ per mile. The water is con- ed to Sacramento County, where it is used in irrigating orchards and eyards and in the gravel mines near Folsom. C. H. Schussler, of Folsom, superintendent.

## Fresno County.

*Artesian Well Belt.*—The flowing wells are limited in number, and nfined to a belt running northwesterly through the lower lands of the n Joaquin Valley, at 160′ to 225′ altitude. An abundant supply of ter may be procured east of this belt, if pumping is resorted to. Good ter for any purpose is very limited on the western side of the valley.

*Browning's, P., Well.*—It is in Sec. 17, T. 17 S., R. 19 E., at about 210′ itude. It is 8″ in diameter, 700′ deep, and flows 5½″ over the casing. ed for stock water. The strata penetrated are alternating horizontal ers of clay and sand; hard, impervious clay overlies the water-bear- sand.

*Burrell's, Mrs., Well.*—It is in Sec. 2, T. 17 S., R. 18 E., at about 210′ itude. It is 6″ in diameter, 650′ deep, and flows 5½″ over the casing. ternating beds of sand and clay were penetrated, and 150′ of blue clay said to overlie the water-bearing sand.

*Enterprise Canal Co.'s Canal.*—It is N. and N.E. of Fresno, and verts water from Kings River. It is 30 miles long, 25′ on top, 15′ on ttom, 2½′ deep, with a grade of 1½′ to 3′ per mile, and a capacity of 0 cu. ft. per second. W. H. Ingels, of Fresno, secretary; F. M. ittenden, of Fresno, superintendent.

*Fresno Canal and Irrigation Co.'s Canal.*—It diverts water from Kings ver, 25 miles E. of Fresno, by a low, temporary wing-dam, and extends stward 50 miles. It is 80′ wide on top, 60′ on bottom, 6′ deep, and e grade varies from 1½′ to 5′ per mile; the capacity is 1,000 cu. ft. r second. The distribution system has a total length of about 450 iles and covers about 160,000 acres in its district; about one half is

now irrigated. W. H. Ingels, of Fresno, secretary; F. M. Chittend of Fresno, superintendent.

*Fresno City's Wells.*—These eight wells in Fresno are at about 3 altitude. They are 10″ and 12″ in diameter, 250′ to 680′ deep, and water rises to within 15′ of the surface. They yield 3,000,000 gals. da by pumping, without affecting the supply perceptibly. The maxim capacity of the 75 H.P. double-action Holly plant is 4,000,000 g daily. Crude petroleum from Santa Paula is used for fuel. It is sta that electricity will shortly be substituted for the motive power. T water is used for domestic and other purposes, under about 110′ pressu from the tank of 250,000 gals. capacity. The strata penetrated are alt nating clay and sand. The following analysis is by Howard Stillm Engineer of Tests, S. P. R. R. Co., at Sacramento:

| | Grains per U. S. Gallon. |
|---|---|
| Calcium carbonate ($CaCO_3$) | 3.55 |
| Magnesium carbonate ($MgCO_3$) | 1.57 |
| Magnesium sulphate ($MgSO_4$) | 0.41 |
| Magnesium di-chloride ($MgCl_2$) | 1.66 |
| Silica ($SiO_2$) | 2.74 |
| Sesquioxide of aluminum and iron ($Al_2Fe_2O_3$) | 0.06 |
| Alkali silicates | 3.79 |
| Organic matter | 0.87 |
| Total | 14.65 |

*Heminghaus', G., Wells.*—Well No. 1 is at the residence, 3 miles of Mendota, at about 200′ altitude. It is 8″ in diameter, 740′ de flows 500,000 gals. daily, and the water is used for domestic and irrig tion purposes. The upper bed of water-bearing sand is 500′ below t surface, below which four similar strata were penetrated, and which a separated by clay. Well No. 2 is 5 miles E. of No. 1, on the south side the San Joaquin River. It is 7″ in diameter, 1,150′ deep, and flows 4 over the casing; water too brackish to use. The strata penetrated are

| | |
|---|---|
| Alluvial sediment | 25′ |
| Red sandy clay, containing small gravel | 1,000′ |
| Compact clay | 100′ |
| Water-bearing sand | 25′ |
| Total | 1,150′ |

*James', J. G., Wells.*—There are six flowing wells on the "Fish Slou ranch," five of which are on the east and one on the west side of t slough. They are 7″ and 8″ in diameter, 600′ to 700′ deep, and flow to 10″ over the casings. One at the ranch-house furnishes water f domestic purposes; the others for stock. The water is all more or le mineralized; sulphur is the most apparent. That on the west side the slough penetrates principally fine alluvial sediment, flows 1″ ov the casing, and is on the border of the "artesian belt." Red and blu clay, with thin layers of sand, are penetrated by the wells on the ea side.

*James' Canal.*—It diverts water from the west side of Fresno Slough and courses N.W. It is 7 miles long, 90′ on top, 80′ on bottom, 2′ dee and irrigates 10,000 acres. J. G. James, of San Francisco, owner.

*John's, A. S., Wells.*—There are two, in Sec. 21, T. 17 S., R. 19 E. The are 8″ in diameter, 600′ and 900′ deep, flow 3″ and 5″ over the casing and are used for watering stock. They penetrate sandy clay and sand with a thin stratum of "hardpan" overlying the water-bearing sand.

Miramonte Colony's Artesian Well, Kern County.

Heminghaus' Artesian Well, Fresno County

*Kings River and Fresno Canal Co.'s Canal.*—It diverts water from Kings River about 25 miles E. of Fresno, and courses westward. It is 2 miles long, 35′ wide on top, 25′ on the bottom, and 3′ deep, with a capacity of 300 cu. ft. per second. W. H. Ingels, of Fresno, secretary; F. M. Chittenden, of Fresno, superintendent.

*Mendota Well.*—It was bored by the S. P. Co. It is 6″ in diameter, 6′ deep, and flows 175,000 gals. daily. It is too strongly mineralized to use in the locomotive boilers, but is used for domestic and medicinal purposes. It penetrates sandy clay, and compact clay overlies water-bearing sand.

*San Joaquin and Kings River Canal and Irrigation Co.'s Canal.*—It diverts water from San Joaquin River at the mouth of Fresno Slough, 2 miles N. of Mendota, at 180′ altitude. It courses N.W. on the west side of San Joaquin River, to near Westly Station, in Stanislaus County. For 11 miles from its head it is a single canal, about 50′ wide and 9′ deep; thence it divides into two parallel canals, which unite at Los Baños Creek and form a single canal the remainder of the way. It is 77 miles long, 92′ wide on top, 80′ on bottom, 4′ deep, with a grade of 1½′ per mile, and irrigates 70,000 acres, from which the company receives remuneration, and the surplus water irrigates 150,000 acres of pasture held for the firm of Miller & Lux. C. R. Merritt, of No. 508 California Street, San Francisco, secretary; D. M. Rons, of Los Baños, superintendent.

## Glenn County.

The eastern and central parts of the county possess many natural advantages for the farmer. The soil for the most part is strong, and the climate well suited for agriculture and horticulture. The entire valley lands possess an almost inexhaustible supply of subterranean water, and water for irrigation may be obtained from the streams. The foothills and valleys of the western part possess good grazing lands, and fruit is grown to some extent. Deposits of chromic iron, and traces of cinnabar, copper, and gold occur in the western part of the county, but no mining is carried on at present. A number of unimproved mineral springs exist among the hills.

*Central Irrigation District's Canal.*—This district was organized under the "Wright law" to include a large part of the valley lands of both Glenn and Colusa counties. The main canal, when completed, will be about 50 miles long, 65′ wide on top, 6′ deep, and with a grade of 5.82″ per mile. It will divert water from the Sacramento River at the N.E. corner of Glenn County, and course southward. The greater part of the excavation has been done, but work on it has ceased, pending litigation. P. Graham, of Williams, secretary.

*Potter's, E. E.* (*Rideout*), *Well.*—See our XIth Report and Bulletin No. 5 pp. 224 and 7. It is on the Rideout ranch, about 2 miles N. of Norman Station. It is 4″ in diameter at the top, 2″ at the bottom, 940′ deep, and flows a fair stream, said to be 6,000 gallons in twenty-four hours.

*Stony Creek Canal.*—It is in the northern part of the county, and recently completed. It is 18 miles long, 24′ wide on the bottom, 30′ on top, and 3½′ deep, with a grade of 12′ per mile. It diverts water from Stony Creek, about 12 miles W. of the railroad, courses eastward via Orland, and will irrigate about 20,000 acres. Glenn County Land and

Water Co., owner; N. K. Spect, of Willows, secretary; T. H. Dodsor Orland, superintendent.

*Wells in the Valley.*—See our XIth Report, p. 225. A good suppl well water may be had in the valley, in the northern part of the cou from a gravel bed 10′ to 20′ below the surface. About Willows i obtained from the second stratum of sand and gravel, at a dept about 40′. About Maxwell and Germantown the second water-bea stratum lies at a depth of about 100′. Surface water—that from n first stratum below the surface—is generally charged with alkali.

## Kern County.

Kern River and Poso Creek afford water for irrigating a vast are the valley, principally west of the S. P. R. R. Numerous canals di water from it, all of which are controlled by the Kern County Land The surplus water flows into Buena Vista Lake, which serves as a t porary reservoir for the Kern Valley Water Co., whose canals distril it to 25,000 to 30,000 acres in a broad belt north and northwestw Those given in the following table are owned or controlled by the K County Land Co., except the Kern Valley Water Co.'s Canal, whic owned by the firm of Miller & Lux.

CANALS ON THE NORTH SIDE OF KERN RIVER.

| Name of Canal. | When Located. | Length, in Miles | Quantity of Water. | | Width on Bottom | Depth of Water | |
|---|---|---|---|---|---|---|---|
| | | | Miner's Inches | Cu. ft. per Sec. | | | |
| Beardsley | Dec., 1873 | 8 | 47,230 | 944 | 40′ | 4′ | .0 |
| Calloway | May, 1875 | 32 | 74,000 | 1,476 | 80′ | 5′ | .8 |
| Edwards | Dec., 1874 | 2 | 1,440 | 29 | 6′ | 1′ | .5 |
| Emery | Dec., 1876 | 3 | 2,000 | 40 | 6′ | 2′ | .5 |
| Goose Lake | July, 1875 | 4½ | 90,000 | 1,800 | 140′ | 3′ | .0 |
| James Dixon | April, 1875 | 3 | 14,000 | 280 | 40′ | 3′ | .0 |
| Johnson | June, 1873 | 4 | 8,640 | 172 | 30′ | 3′ | .5 |
| Joice | June, 1875 | 4 | 6,250 | 125 | 10′ | 2′ | .0 |
| Jones Tuckey | June, 1876 | 4 | 1,000 | 20 | 4′ | 2′ | .5 |
| McCaffrey | Oct., 1874 | 3 | 1,296 | 26 | 10′ | 2′ | .5 |
| McCord | Mar., 1875 | 14½ | 5,000 | 100 | 30′ | 3′ | .5 |
| Pioneer | Apr., 1873 | 11½ | 20,074 | 400 | 40′ | 3′ | .0 |
| Railroad | July, 1874 | ⅗ | 31,075 | 624 | 40′ | 3′ | .0 |
| Wible | May, 1875 | ⅕ | 5,040 | 100 | 40′ | 3′ | .0 |

CANALS ON THE SOUTH SIDE OF KERN RIVER.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Anderson | Oct., 1872 | 4 | 5,057 | 101 | 20′ | 2′ | .5 |
| Buena Vista | July, 1870 | 13½ | 14,000 | 279 | 30′ | 3′ | .0 |
| Castro | | 5 | 1,000 | 20 | 16′ | 18″ | .0 |
| Farmers | April, 1873 | 19¾ | 14,400 | 288 | 30′ | 3′ | .0 |
| Frazer | April, 1873 | 2¼ | 2,600 | 52 | | | |
| Gates | Oct., 1878 | 2½ | 5,057 | 101 | 12′ | 2′ | .5 |
| Henley | Jan., 1874 | 2½ | 2,880 | 57 | | | |
| James | Oct., 1871 | 17¼ | 19,730 | 394 | 40′ | 3′ | .0 |
| Kern Island | 1870 | 30 | 20,000 | 400 | 40′ | 4′ | .0 |
| Kern Valley Water Co. | April, 1877 | 40 | 130,000 | 2,594 | 125′ | 10′ | .9 |
| Meacham | April, 1873 | 4 | 1,500 | 30 | 12′ | 2′ | .5 |
| Old S. Fork | | 3 | 3,800 | 75 | 20′ | 2′ | .0 |
| Plunket | Dec., 1872 | 3¾ | 5,057 | 101 | 12′ | 2′ | .5 |
| Stine | Dec., 1872 | 47½ | 55,980 | 1,117 | 30′ | 3′ | .0 |
| Wilson | Aug., 1874 | 2½ | 500 | 10 | 4′ | 2′ | .5 |

There are numerous artesian wells in a belt 15 to 20 miles wide in the northern central part of San Joaquin Valley, west of the S. P. R. R. They are yet too thinly distributed in the southern part to delineate definitely the limit of their possible area. The strongest flowing wells are in Tps. 25 and 26 S., R. 22, 23, and 24 E. The better ones are said to flow 1,000,000 to 2,500,000 gals. daily, but farther south the flow increases as the limit of the area is approached. The waters are all more or less mineralized, and their temperature is generally 65° to 75° F. In a few cases calcium carbonate has crystallized out of the water on the inside of the casings, and diminished the flow. The decrease in flow of many of the older wells is probably due to this cause. It is said that no immediate decrease in flow has been noted by increasing the number of wells, which is unusual in artesian areas. The wells in this area, principally 8″ diameter, though in a few cases larger, are 225′ to 600′ deep. They penetrate five to fifteen strata of impervious clay, varying in thickness and character, lying almost horizontally, and separated by thin beds of water-bearing sand and gravel. The wells are lined with heavy sheet iron to the bottom, which is perforated at each water-bearing stratum, and the total flow obtained. Unfortunately samples of the various strata have not been preserved, with records of their thickness and depth, which would throw much light upon the structure of the area. Along the western boundary of the valley, water is very limited in quantity, strongly alkaline, and no artesian wells occur, though deep ones have been bored. The following analyses of waters from this county are by Howard Stillman, Engineer of Tests, S. P. R. R. Co., of Sacramento:

*Bakersfield Well* (230′ deep).

| | Grains per U. S. Gallon. |
|---|---|
| Calcium carbonate ($CaCO_3$) | 4.95 |
| Calcium sulphate ($CaSO_4$) | 0.70 |
| Silica ($SiO_2$) | 3.73 |
| Sesquioxide of alumina and iron ($Al_2Fe_2O_3$) | 0.76 |
| Sodium sulphate ($NaSO_4$) | 1.92 |
| Sodium chloride ($NaCl$) | 1.87 |
| Total | 13.93 |

*Kern City Artesian Well.*

| | Grains per U. S. Gallon. |
|---|---|
| Calcium carbonate ($CaCO_3$) | 3.44 |
| Calcium sulphate ($CaSO_4$) | 0.29 |
| Magnesium carbonate ($MgCO_3$) | 0.29 |
| Magnesium sulphate ($MgSO_4$) | 0.35 |
| Silica ($SiO_2$) | 0.99 |
| Sesquioxide of alumina and iron ($Al_2Fe_2O_3$) | 0.07 |
| Sodium sulphate ($NaSO_4$) | 0.87 |
| Sodium chloride ($NaCl$) | 1.16 |
| Alkali silicates | 2.57 |
| Total | 10.03 |

*Lo Kern Artesian Well* (7″ in diameter, 700′ deep).

| | Grains per U. S. Gallon. | After One Week. |
|---|---|---|
| Calcium carbonate ($CaCO_3$) | 0.58 | 1.22 |
| Calcium sulphate ($CaSO_4$) | 6.00 | 4.08 |
| Calcium di-chloride ($CaCl_2$) | 1.74 | 1.28 |
| Magnesium carbonate ($MgCO_3$) | 0.41 | ---- |
| Silica ($SiO_2$) | 0.76 | 1.10 |
| Sodium chloride ($NaCl$) | 27.51 | 23.84 |
| Organic matter | 1.40 | ---- |
| Totals | 38.40 | 31.52 |

## Kings County.

It lies west of Tulare County, and consists principally of valley la but includes a small area of foothills of the Coast Range. Stock-rai horticulture, and agriculture are important industries. More 100,000 acres are said to be under irrigation, which can be consider increased. Artesian wells are numerous in the western part and a a large amount of water for domestic, stock, and irrigation purp Wheat-growing in the eastern part of the county is being rapidly repl by fruit and vegetables where water is available for irrigation. Mi industries are necessarily of minor importance. The bituminous fo tion occurs in the western part of the county, but is undeveloped. our Bulletin No. 3, p. 53.

There are numerous artesian wells in the eastern part of this co in a belt extending west to Lemoore and the western part of Tu Lake, at 220′ to 280′ altitude. They afford a vast quantity of water domestic, irrigation, and stock purposes. They are 7″ to 9″ in diam and flow ½″ to 5″ over the casing. The greater part of the flowing w is obtained from two or more thin strata of gravel and sand, 450′ to deep. A well at Artesia Hotel, in Hanford, is said to be 1,300′ deep, no flowing water was obtained below 760′. The water-bearing gra are overlaid by from 100′ to 150′ of impervious blue clay, which is o laid by strata of clay and sands in alternating layers, varying in c acter, thickness, and extent. There are five important irrigation dist in the county, which divert water from Kings River and Cross Cree

*Lakeside Ditch Co.'s Canal.*—It diverts water from Cross Creek in 24, T. 19 S., R. 22 E., runs southwesterly, and is 50′ wide on top, 30 bottom, 3′ deep, with a grade of 2′ per mile, and capacity of 302 cu per second. There are 3 miles of trunk and 20 miles of branch li It covers about 40,000 acres, and 25,000 are now irrigated. S. Mana of Hanford, secretary.

*Last Chance Ditch Co.'s Canal.*—It diverts water from Kings Ri in Sec. 26, T. 17 S., R. 21 E., and runs westerly. The main canal miles long, 30′ wide on top, 25′ on bottom, 5′ deep, with a grade of 2′ per mile, and a capacity of 250 to 300 cu. ft. per second. It irrig 15,000 to 20,000 acres. John Worswick, of Armona, secretary.

*Lower Kings River Ditch and Water Co.'s Canal.*—It diverts w from Kings River below the Last Chance ditch, and runs in a south direction. The main canal is 7 miles long, 30′ wide on top, and 25 bottom, 4′ deep, with a capacity of 250 cu. ft. per second. It is sai irrigate 20,000 acres. S. McGlothen, of Lemoore, secretary.

*People's Ditch Co.'s Canal.*—It diverts water from Kings River in 1, T. 17 S., R. 22 E., and runs southwesterly. The main canal is 8 m long, 30′ wide on top, 25′ on bottom, 5′ deep, with a grade of 1′ to 2′ mile, and a capacity of 300 cu. ft. per second. It is said to irri 20,000 acres. W. R. McQuiddy, of Hanford, secretary.

*Riverside Ditch Co.'s Canal.*—It diverts water from Kings River, ab 6 miles N. of Hanford, and is said to irrigate about 20,000 acres. I Lens, of Hanford, secretary.

## Los Angeles County.

*lamitos Land Co.*—Its irrigation pipe-line system is situated near g Beach. The water is obtained from artesian wells. W. F. Sweeney, o. 306 E. First Street, Los Angeles, secretary.

*lpine Springs Land and Water Co.*—Its irrigation system is situated Alpine, and diverts water from Little Rock Creek. The canal is 9 es long, 7½′ wide on top and 5′ deep, with a grade of 200′ to 316′ per e; capacity, 12,500 miner's inches. G. T. Cole, of No. 136 S. Broad-, Los Angeles, secretary.

*zusa Land and Water Co.*—Water is diverted from San Gabriel River, used for irrigation near Azusa. The canal is 5 miles long, 7′ wide op and 5′ deep, with a grade of 10′ to 12′ per mile; capacity, 3,500 er's inches. M. Albee, of No. 57 Bryson Block, Los Angeles, secretary.

*arton Land and Water Co.*—Its irrigation system is situated near nyside, and includes the two following systems: The old *Mill Creek* nja," which is 6 miles long, and the *Sunnyside* ditch, also 6 miles g, together with 25 miles of pipe. Total capacity is 600 miner's nes. The old zanja diverts water from Mill Creek and the Sunny- from the Santa Ana River. C. Lautz, of No. 207 Bradbury Block, Angeles, secretary.

*outon Water Co.*—Water is obtained from two artesian wells, 340′ 372′ deep, and the irrigation system is situated 4 miles N. of Long ch, and has a capacity of 220 miner's inches; 16,410′ of 15″ pipe 30,000′ of 4″ pipe are used. The grade is undulating, and at one t pressure has to be used to overcome a rise of 6′; after that the de is 42″ in 1,800′. Gen. E. Bouton, of No. 121 S. Broadway, Los eles, president.

*olumbia Colonization Co.*—Its irrigation system is situated near tor, San Bernardino County, but extends into Los Angeles County. e canal is 46 miles long, 80′ wide on top, 40′ on bottom, and 10′ deep, h a grade of 4.4′ per mile; capacity, 60,000 miner's inches. The er is diverted from Mojave River at Upper Narrows, near Victor. V. Wilson, of No. 318 Stimson Block, Los Angeles, secretary.

*rystal Springs Land and Water Co.*—This company supplies the er used by the Los Angeles City Water Co. Its main line con- s of about 5 miles of 44″ pipe and conduit, with a capacity of about 000,000 gals. per day. The water is derived from water-bearing ta on the Los Feliz ranch, in the San Fernando Valley. The method obtaining it is as follows: Sewer pipes are laid in the water-bearing nation, at a depth of 12′ to 20′, and loosely fitted together; the bells he joints being turned toward the subterranean flow. By this means water forces its way through the joints and into the pipes, but it s not carry sand with it. This company also diverts water from the oyo Seco, at a point about 3 miles N.E. of Los Angeles. The water m the last-mentioned source is conveyed to Los Angeles by a pipe- e with a capacity of 100 miner's inches. S. H. Mott, of No. 303 New gh Street, Los Angeles, secretary.

*Gardena Water Supply Co.*—Its irrigation pipe-line system is situated miles N.E. of Redondo, and the water is obtained from artesian wells. Pomeroy, of No. 105 Broadway, secretary.

*Laguna Irrigation Co.*—Its system is near Los Angeles. The canal is miles long, 4′ wide on top, 4′ on bottom, and 2′ deep; capacity, 195

miner's inches. The water is obtained from lagoons and artesian w
G. Pomeroy, No. 105 S. Broadway, secretary.

*Loma Vista Ranch Co.*—Its irrigation system is situated near Hov
Summit, and consists of 10 miles of pipe and open ditches. The w
is diverted from Los Angeles sewers. W. W. Howard, of No. 304
First Street, secretary.

*Los Angeles City Water Co.*—This company distributes the water
plied by the Crystal Springs Water Co. through about 2,000,000′ of
and conduit in the City of Los Angeles. This company also div
water, for power purposes, from the Los Angeles River at a point al
7 miles N. of Los Angeles. A canal of 6 miles in length conducts
water to power stations, where the power is used for pumping a por
of the water supplied by the Crystal Springs Co. The water dive
from the Los Angeles River is returned to that stream in N. Los Ang
S. H. Mott, of No. 209 Marchessault Street.

*Marengo Water Co.*—Its irrigation system is situated near Pasad
The main line is 20″ wide, 20″ deep, and irrigates 40 acres. M. Al
of No. 22 Burdick Block, Los Angeles, secretary.

*Palmdale Irrigation Co.*—Its irrigation system is situated near Pa
dale. The canal is 8 miles long, 8′ wide on top, 5′ on bottom, an
deep, with a grade of 7½′ per mile. Its capacity is 980 miner's inc
The water is diverted from Little Rock Creek. C. W. Denhoff, of
118½ S. Broadway, Los Angeles, secretary.

*Porter Land and Water Co.*—This irrigation system is situated in
Fernando Valley. Twenty-six miles of pipe are used. The wate
diverted from San Fernando Creek, and also obtained in part from a
sian wells. J. B. Threlkeld, of No. 3 California Bank Building,
Angeles, secretary.

*Puente Land and Water Co.*—Its irrigation system is situated in
San Gabriel Valley, and the main canal is 3 miles long, 3′ wide, an
deep. Also 25,000′ of 10″ pipe is used. The capacity of main can
200 miner's inches. The water is diverted from San José Creek.
Pomeroy, of No. 105 S. Broadway, Los Angeles, secretary.

*San Gabriel Valley Land and Water Co.*—This irrigation syste
situated in San Gabriel Valley, and the main canal is 4 miles l
besides 2,000′ of tunnels. Its capacity is 50 miner's inches. The w
is obtained from artesian wells. E. K. Alexander, of No. 145 S. Bro
way, Los Angeles, secretary.

*San José Ranch Co.*—Its irrigation system is situated near San Di
The main line is 41 miles of 12″ and 14″ pipe. The capacity is
miner's inches. The water is obtained from fifteen artesian wells. M
Wicks, Jr., of No. 118 S. Main Street, Los Angeles, secretary.

*Sierra Bonita Colonies* are situated near Palmdale. Their canal
miles long, 7′ wide on top, 5′ on bottom, and 1½′ deep, with a grade of
per mile, and capacity of 900 miner's inches. The water is diver
from Little Rock Creek. A. A. Lawson, of No. 136 S. Broadway,
Angeles, secretary.

## Madera County.

The area in which flowing wells occur is in the western part of
county, and extends eastward to within 2 to 3 miles of the S. P. R.
At Madera the water rises within 5′ of the surface, and cannot
exhausted by pumping.

*liss Ranch.*—It is E. of the railroad, in the northern part of the nty, and joins the California Pastoral and Agricultural Co.'s ranch. re are twelve artesian wells on the ranch, 6″ to 10″ in diameter, 175′ 00′ deep, which flow 15,000 to 200,000 gals. daily. The water is ncipally used for stock. The strata penetrated are alternating heavy s of clay and thin layers of sand and gravel, irregular in character in quantity of water furnished. George Bliss, of San Francisco, ner.

*alifornia Pastoral and Agricultural Co.'s Wells.*—The ranch is in the thwestern part of the county, at 100′ to 150′ altitude. There are rteen flowing wells, 7″ in diameter, 175′ to 314′ deep, which flow 00 to 275,000 gals. daily; water used principally for stock. The owing strata were penetrated by one well, which is typical of the ion:

| | |
|---|---|
| Soil | 2′ |
| Fine sand with streaks of clay | 98′ |
| Hardpan | 0′ 6″ |
| Sand | 95′ 6″ |
| Blue clay | 100′ |
| Water-bearing sand and gravel. | |

ac Bird, Jr., of Merced, superintendent.

*howchilla Canal.*—It diverts water from San Joaquin River, 3 miles ve the mouth of Fresno Slough, and runs northwesterly across the nty. It is about 26 miles long, 40′ wide on top, 30′ on bottom, 2′ to 4′ p, and with 1′ to 6′ grade per mile. The water is used for irrigating lfa, grazing lands, and for watering stock. California Pastoral and ricultural Co., Miller & Lux, owners.

*Madera Canal and Irrigation Co.'s Canal.*—It diverts water on the t side of the great valley from the Fresno, Merced, and San Joaquin ers. The main canal is 22 miles long, 40′ wide on top, 20′ on bottom, leep, and with a grade of 4″ per mile. It irrigates 8,000 to 18,000 es per year, and by increasing the storage capacity, 100,000 acres ld be irrigated. D. C. Bates, Nevada Bank, secretary; J. A. Hutton, Madera, superintendent.

*Miller & Lux Wells.*—Their ranch is in the western part of the county l south of the California Pastoral Co.'s. The wells are 7″ in diam- er, 1,260′ to 1,300′ deep, and furnish a vast quantity of water for stock rposes.

*Rightmire's, Mrs., Well.*—It is in Sec. 11, T. 10 S., R. 13 E., at the rthern boundary of the county. It is 8″ in diameter, 300′ deep, flows out 700,000 gals. daily, and is used for domestic, irrigation, and stock rposes.

## Merced County.

*Artesian Belt.*—See our Xth Report, p. 324. It runs N.W. and S.E. ough the county, extends eastward to within 1½ to 4 miles of the P. R. R. and westward approximately to the San Joaquin and Kings ver Canal. There are 100 or more flowing wells in the county, fur- shing a large quantity of water for stock, irrigation, and domestic rposes. All the artesian water is slightly mineralized, and in a few lls near the San Joaquin River it is brackish. Practically an inex- austible supply of water may be had from pumped wells in the valley st of the artesian belt, and rises more or less above the water-bearing

strata. As the foothills are approached eastward the strata are m porous and variable, and the water more confined to channels.

*Bowman's, Cylas, Wells.*—They are in Sec. 4, T. 9 S., R. 13 E. miles S.W. of Merced, at 120′ altitude. Four are 7″ in diameter, to 385′ deep, and flow ¼″ to 1″ over the casings. One is 9″ in diame 697′ deep, flows 1½″ over the casing, and irrigates 20 acres of alf The strata penetrated are alternate layers of clay, sandy clay, sand, gravel. A 70′ bed of impervious blue clay was struck at 180′, over by sand and underlaid by sand and sandy clay. Numerous other w in that locality are very like these.

*Crew's, Wm., Well.*—It is in Sec. 27, T. 6 S., R. 9 E., at about altitude. It is 7″ in diameter, 320′ deep, and said to flow 350,000 g daily. It is the strongest flowing well in the county, north of Me River. The strata penetrated are alternating beds of clay and sand

*The Crocker and Huffman Land and Water Co.'s Canal.*—See our Report, p. 329. It diverts water from Merced River 3 miles above Sn ing, and is 21 miles long, 100′ wide on top, 60′ on the bottom, 4½′ d with a grade of 1′ per mile, and of 1,200 cu. ft. per second capac The main line ends at Yosemite Lake, which serves as a storage re voir, and is about 500 acres in area, and 60′ deep at the embankm The water is used for irrigation, and is also piped from the reservoi Merced for municipal supply. About 240,000 acres can be irrigated this system, and 10,000 acres are now irrigated. J. D. Bradley, Merced, secretary; Charles D. Martin, of Merced, superintendent.

*Dos Palos Well.*—It is at Dos Palos, on the southern boundary of county, at about 120′ altitude. Is 6″ in diameter, said to be 500′ d and has a strong flow. The water is too highly mineralized to use boilers. The well is said to penetrate alternating layers of clay a sand, and water flows from three strata, 300′, 350′, and 400′ d respectively.

*Goldtree's (Galland) Well.*—It is in Sec. 27, T. 8 S., R. 13 E., 6 m S.E. of Merced. It is 10″ in diameter, about 650′ deep, and said to f 350,000 gals. daily, which irrigates 40 acres of vines. The strata pe trated are alternating beds of clay and sand.

*Hall's, W. W., Wells.*—There are five in Sec. 22, T. 6 S., R. 9 E miles N. of Merced River and 1 mile E. of San Joaquin, 7″ in diame 318′ to 326′ deep, and each flows from 8,000 to 25,000 gals. daily; pr cipally used for stock. The strata are sand to the blue clay, wh overlies the water-bearing sand.

*Hess', H. (Mull's), Wells.*—There are eight flowing wells on the "M ranch," Sec. 24, T. 9 S., R. 13 E., 12 miles S. of Merced, at about 1 altitude. Seven are 7″ and 8″ in diameter, average 300′ deep, and f ¼″ to ½″ over the casings; one is 10″ diameter, 1,013′ deep, and said flow 600,000 gals. or more daily. Flowing water is obtained in a nu ber of strata 203′ to 680′ deep; the strongest from 660′ to 680′ deep, b no flowing water was obtained below 680′. The strata penetrated a alternating clay and sand.

*Los Baños Station. Well.*—See our Xth Report, p. 325. It is 8″ d meter and 434′ deep. The water is said to be injurious to boilers, a is seldom used.

*Los Baños Waterworks Well.*—It is in Los Baños, 8″ diameter, 4 deep, and flowed, when first completed, 85,000 gals. daily; 36,000 ga

pumped in nine hours, without decreasing the supply perceptibly. d for municipal purposes. The strata penetrated are—

| | |
|---|---|
| Surface soil | 6′ |
| Gravel | 9′ |
| Sandy clay | 65′ |
| Soft sandstone | 4′ |
| Soft clay | 20′ |
| Hard, light-colored dry clay | 58′ |
| Soft sandstone | 5′ |
| Yellow sandy clay | 35′ |
| Tough blue clay | 237′ |
| Sand and water | 7′ |
| Total | 446′ |

*Merced Falls Power and Manufacturing Co.*—This company has constructed a dam, 315′ long, and 18′ high, across the Merced River at Merced Falls. It is estimated that 2,000 H.P. will be developed during the lowest stage of the river. It is the intention to install electric machinery for power and light, to be distributed to the surrounding county. Merced Falls Electric Power and Manufacturing Co., owner; John T. Fleming, of Alameda, superintendent.

*Miller & Lux Wells.*—There are six or more on the stock ranch on the San Joaquin River, one of which is on the west side. They are 6″ to 8″ diameter, 230′ to 300′ deep, and furnish considerable water for stock. They penetrate variable strata of clay and sand.

*Mitchell (J. W.) Estate Wells.*—The ranch is on Merced River, W. of the S. P. R. R. There are six flowing wells S. of the river and three N. of it, 7″ diameter, 350′ to 370′ deep, and flow ¾″ over the casing. The strata penetrated by the wells in the northern part are about 275′ of sand and sandy clay; 25′ to 60′ of impervious blue clay overlies the water-bearing gravels, but farther south the clay strata increase in number and thickness. The water from the wells south of the river is used for stock, irrigation, etc., but those north of the river are more or less brackish.

*Newman's, S., Wells.*—One well, 4 miles N. of Volta Station, is 8″ diameter, 386′ deep, and flows 450,000 gals. daily. One well near Legomar is 8″ diameter, 370′ deep, and flows 50,000 gals. daily. The strata penetrated are clays and sand similar to those at Los Baños.

*Ould's, E., Well* (Artesian and Gas).—See our Bulletin No. 3, p. 20. It is 4 miles S.W. of Merced, 8″ diameter, 675′ deep, and flows ½″ over the casing. It affords considerable natural gas, which has been utilized, but is now wasted. It is said the gas was struck at a depth of 654′.

*Rodner's, John, Well.*—It is in Sec. 16, T. 8 S., R. 13 E., 6 miles S.W. of Merced, at about 150′ altitude. It is 9″ diameter, 709′ deep, and flows 20,000 gals. daily; it is used for domestic and irrigation purposes. The following section of strata penetrated is furnished by the owner:

| | Feet. | | Feet |
|---|---|---|---|
| Rock adobe | 8 | Yellow clay | 6 |
| Yellow clay | 4 | Sand | 4 |
| Sand | 13 | Pink clay | 10 |
| Blue clay | 2 | Yellow clay | 9 |
| Gray "slum" | 73 | Soft sandstone (compact sand) | 2 |
| Red clay | 14 | Loose sand | 3 |
| Soapstone" | 13 | Yellow clay | 12 |
| Blue clay | 53 | Tough pink clay | 11 |
| Water-bearing sand (first flow) | 1 | Sand (bottom of 9″ casing) | 2 |
| Blue clay | 8 | Yellow clay | 5 |
| Sand | 3 | Gravel | 12 |

| | Feet. |
|---|---|
| Red clay | 12 |
| Gravel | 1 |
| Sand | 1 |
| Yellow clay | 7 |
| Soft sandstone | 3 |
| Red clay | 14 |
| Gravel | 18 |
| Hard yellow clay and granite bowlders | 13 |
| Hard gray soapstone with limestone bowlders | 6 |
| Sand | 2 |
| Red clay | 5 |
| Hard soapstone | 29 |
| Red clay | 6 |
| Sand | 3 |
| Soapstone | 6 |
| Red clay | 9 |
| Sand | 2 |
| Red clay | 10 |
| Sand (⅛″ flow) | 12 |
| Yellow clay | 12 |
| Sand | 4 |
| Blue clay | 2 |
| Sand (⅛″ flow) | 7 |
| Blue clay | 7 |
| Sandy clay | 20 |
| Sand | 1 |
| Blue clay | 1 |
| Gravel (⅜″ flow) | 1 |
| Hard blue clay | [illegible] |
| Sand (⅛″ flow) | [illegible] |
| Blue clay | [illegible] |
| Sand (⅛″ flow) | [illegible] |
| Blue sandy clay (bottom of 8″ casing) | [illegible] |
| Compact sand (½″ flow) | [illegible] |
| Blue clay | [illegible] |
| Sand (¼″ flow) | [illegible] |
| Blue clay | [illegible] |
| Sand (¼″ flow) | [illegible] |
| Blue clay | [illegible] |
| Sand (1/16″ flow) | [illegible] |
| Blue clay | [illegible] |
| Sand (1/16″ flow) | [illegible] |
| White clay | [illegible] |
| Blue clay | [illegible] |
| Sand (1/16″ flow) | [illegible] |
| Blue clay | [illegible] |
| Sand (⅛″ flow) | [illegible] |
| Blue clay (bottom of 7″ casing at 680′) | [illegible] |
| Sand | [illegible] |
| Blue clay | [illegible] |
| Sand | [illegible] |

The casing was perforated at all the water-bearing strata when c[illegible]pleted.

*San Joaquin and Kings River Canal and Irrigation Co.'s Canal.*—[illegible] our Xth Report, p. 329. See also Fresno County. It is on the west [illegible] of the San Joaquin River, and irrigates a belt running N.W. thro[illegible] the county.

*Saunder's, J. J., Wells.*—There are seven flowing wells on his ra[illegible] in Sec. —, T. 8 S., R. 12 E., 8 miles W. of Merced. They are [illegible]″ diameter, about 230′ deep, and flow 40,000 to 200,000 gals. daily. U[illegible] for stock and domestic purposes. The strata penetrated are alterna[illegible] beds of clay and sand of varied character.

*Stephenson's, J. J., Wells.*—There are eight flowing wells on his ranch [illegible] the east side of the San Joaquin River and at the mouth of the Mer[illegible] River. They are 7″ diameter, 275′ to 340′ deep, and flow from 50,[illegible] to 200,000 gals. daily; the water is used for stock and irrigation pr[illegible]poses. The strata are sand, with more or less sandy clay for ab[illegible] 275′; 25′ to 60′ of blue clay overlies the water-bearing gravels. It th[illegible] out as the eastern boundary of the artesian belt is approached.

*Stephenson & Mitchell's (East Side) Canal.*—See our Xth Report [illegible] 329. It diverts water on the east side of and from San Joaquin Ri[illegible], in Sec. 6, T. 9 S., R. 12 E., and courses northwesterly. It is 25 m[illegible] long, 45′ wide on top, 20′ on bottom, 3′ deep, with a grade of ½′ [illegible] mile. The water is used for irrigation.

## Mono County.

*Twin Lakes.*—They are 10 miles S.W. from Bridgeport, at 7,5[illegible] elevation, and lie near the eastern base of the Sierras. Each is ab[illegible] ½ mile long and wide, and are connected by a narrow channel ¼ m[illegible] long. The water therefrom flows into Robison Creek, which fe[illegible] several irrigating canals meandering through Bridgeport Valley.

## Monterey County.

Flowing wells are only in the lowlands of the Salinas and Pajaro leys west of Castroville. The water-bearing gravel beds extend nost throughout the Salinas Valley, however, and where penetrated bored wells, 75′ to 130′ deep, the water generally rises considerably ove the water-bearing strata, which are 10′ to 15′ below the surface, at linas; about 41′ at King City; and about 40′ N.E. of Castroville. ley all afford a large quantity of water by pumping. The strata netrated are principally thin beds of sand and gravel and heavy beds impervious clays lying nearly horizontally.

*Barden's, Charles, Well.*—It is at Blanco, near the Salinas River. It 114′ deep, 7″ diameter, and flows a 2″ stream. The strata penetrated sand and clay.

*Castroville Station Wells.*—There are two; one of which is 10″ in meter and 217′ deep; the other is 7″ and 196′ deep. The water rises within 10′ of the surface. They afford a large quantity by pumping.

*Clark's Well.*—It is 1½ miles S. of Castroville. It is 5″ diameter, 125′ ep, and the flow is light.

*Collins', James, Well.*—It is 1 mile S. of Castroville. It is 5″ diameter, 6′ deep, and light flow.

*King's, C. H., Well.*—It is at King City, at 330′ altitude. It is 7″ meter, 250′ deep, and the water rises to within 40′ of the surface. The ata penetrated are—

| | |
|---|---|
| Soil and clay | 45′ |
| Gravel | 3′ |
| "Sticky sediment" | 100′ |
| Conglomerate | 5′ |
| Tough clay | 15′ |
| Sandy clay and sediment | 75′ |
| Gravel | 7′ |
| Total | 250′ |

*Murphy's, B., Well.*—It is in Castroville. It is 7″ diameter, 78′ deep, d water rises to within 13′ of the surface.

*Romie's, C., Wells.*—These two wells are 1 mile W. of Soledad, and id to be 71′ and 91′ deep. The water-bearing stratum is sand, overlaid clay. They afford a large quantity of water by pumping.

*Salinas Deep Well.*—See our Xth Report, p. 346. It is near the court-use, Salinas, and said to be 1,300′ deep, penetrating clay, sand, and avel. A record of the strata passed through to a depth of 777′ is given our Xth Report. A flow of gas was struck, but too small to be used ofitably.

*Ulrey's Well.*—It is in King City. It is 7″ diameter, 115′ deep, and e water rises to within 40′ of the surface; it is charged to some extent th minerals.

## Nevada County.

*Badger Hill Ditch.*—It heads on south side of Wolf Creek, at the aryland Mine, taking the waste water 1¼ miles to the Crown Point ine. It is 4′ on top, 3′ on bottom, 3½′ deep, with a 6′ grade per mile, d of 800 inches capacity. The 14″ pipe-line is 400′ long and gives 80′ ad.

*Birdseye Creek Ditch.*—It heads in Steep Hollow and extends to ... Bet. It is 4′ on top, 3′ on bottom, and 3½′ deep, with a 14′ grade ... mile.

*Blue Tent Ditch.*—It is on the Yuba River, at head of Bear Val... near Fall Creek, and is 35 miles long, running first to Omega. It i... on top, 5′ on bottom, and 4′ deep, with a 12′ grade per mile, and of 5,... inches capacity. From Omega to Blue Tent it is 5′ on top, 4′ on bott... and 4′ deep, with a 12′ grade per mile.

*Cement Hill Ditch.*—It heads on Rock Creek, 1½ miles above Su... Loaf Hill, and is 10 miles long, 3½′ on top, 2½′ on bottom, and 2′ d... with a 14′ grade per mile, and of 500 inches capacity.

*Eagle Bird Ditch.*—It diverts water on the south side of the So... Yuba River, and is 4½ miles long, 4′ on top, 3′ on bottom, and 3′ d... with a 14′ grade per mile, and of 800 inches capacity. The wate... delivered to the Eagle Bird hoist, under 250′ head.

*Eureka Lake Ditch System.*—No data.

*Excelsior Water Co.*—Its ditch starts 2½ miles from White's Cr... ing, and 4 miles N.W. of Nevada City, on the South Yuba Ri... and extends along the south bank to Smartsville. It is 35 miles lo... 5′ on top, 4′ on bottom, 4′ deep, with 14′ grade per mile. It has a sec... ditch heading on the south side of Deer Creek, and carrying 1,0... miner's inches 35 miles to Rough and Ready and Penn Valley; it i... on top, 3′ on bottom, 3′ deep, with a 14′ grade per mile.

*Farrel Ditch.*—It heads on the east side of Wolf Creek, below Alli... Ranch, and runs to the Southern mill. It has a capacity of 400 min... inches, and is 3½′ on top, 2½′ on bottom, 2′ deep, with a 14′ grade per m...

*Gauthier Ditch.*—It heads 1,000′ below the Maryland Mine and ab... the Crown Point Mine, south side of Wolf Creek. It is 3½′ on top, ... on bottom, 2′ deep, and 1 mile long, with a 14′ grade per mile, carry... 2,000 miner's inches, delivered under 40′ head.

*Hawkins Ditch.*—It heads on the west side of Wolf Creek below ... Omaha Mine, and carries water ½ mile to the Franklin shaft, deliver... 200 inches under 60′ head. It is 3′ on top, 2½′ on bottom, and 1½′ de... with a 14′ grade per mile.

*Laramie Ditch System.*—It heads on Wolf Creek, at a point below ... Massachusetts Hill power-house, and is 4′ on top, 3′ on bottom, 3′ de... with a 16′ grade per mile, and carries 700 miner's inches. It runs e... of the Omaha hoisting works, and is 1¾ miles in length; at this point i... bulkhead with two lines of 30″ pipe, 600′ long, giving at the hoist... works 95′ head. The water is then picked up, together with Oma... waste water, and conducted to a point east of the Allison Ranch sh... by a ditch on the east side of Wolf Creek, 1½ miles long, 4½′ on top ... on bottom, and 3½′ deep, with a 14′ grade per mile, and capacity ... 1,000 miner's inches. At the end of the ditch the Allison Ranch M... takes the water through a 30″ pipe, 500′ long, and under 65′ head at ... hoisting works.

*Little York Ditch.*—It heads at Bear Valley, on the north side of B... River, and runs 30 miles to Little York. It is 5′ on top, 4′ on botto... and 4′ deep, with a 14′ grade per mile, and of 1,500 miner's inc... capacity.

*Martin Ford Ditch.*—It takes water from Wolf Creek at Bost... Ravine, and carries it to the Granite Hill Mine, a distance of 1,800′, ... a ditch 4′ on top, 3′ on bottom, and 3′ deep, with a 14′ grade per m...

l of 600 inches capacity. It falls 18′ into the Laramie ditch, going ranite Hill Mine.

*Milton Ditch Co.*—No data.

*Nevada County Electric Power Co.'s Flume.*—This heads 1¼ miles ve Perkins bridge on the South Yuba River, and is 3½ miles long. s 6′ wide and 5′ deep, with a 12½′ grade per mile, and of 5,000 miner's hes capacity; it is carried to a point 500′ E. of the dam of the Excel- r Mining Co., and thence, in two 36″ pipes 500′ long, to the power- se under 200′ pressure.

*Norambague Ditch.*—It heads on the east side of Wolf Creek, 1,000′ ow the Southern mill, and runs 1 mile to the Norambague Mine d delivered under 75′ head. It is 4′ on top, 3′ on bottom, and 2½′ p, with a 14′ grade per mile, and of 600 inches capacity.

*North Bloomfield Ditch.*—It heads at Bowman's Dam and is 40 miles g to North San Juan, and of 3,000 inches capacity; the ditch is 6′ on , 4′ on bottom, and 4′ deep, with a 14′ grade per mile.

*Omega Ditch.*—It heads on South Yuba River, ½ mile below Blue Tent. is 15 miles long, 4′ on top, 3′ on bottom, and 3½′ deep, with a 14′ de per mile, and of 1,500 miner's inches capacity.

*Paddy Campbell Ditch.*—It heads on the west side of Wolf Creek, 1 le below the Southern mill, and is 25 miles long to Smartsville; it is 4′ on top, 3′ on bottom, 3½′ deep, with grade of 14′ per mile, and of 800 ner's inches capacity. It is used for irrigation around Smartsville.

*Southern Ditch.*—It heads on the west side of Wolf Creek, below the lison Ranch, and runs 2 miles to the Southern mill, carrying 400 hes in a ditch 3½′ on top, 2½′ on bottom, and 2′ deep, with a 14′ de per mile, giving 100′ head at the mill.

*South Yuba Water and Mining Co.*—Its canal heads at Lake aulding on the South Yuba, above Bear Valley, N. of Emigrant Gap. e main ditch is 45 miles long, 8′ on top, 5′ on bottom, 4′ deep, with 14′ grade per mile, and has a capacity of 5,000 miner's inches. It s the following branches: *The First branch* starts near Holsenbecker ace, comes by Banner Hill to Bryan's ranch, and is 5 miles long, on top, 4′ on bottom, 4′ deep, with a 14′ grade per mile, and has a pacity of 3,000 miner's inches. It empties into two reservoirs, one ned by the Maryland Co., and the other by the Grass Valley Water . These reservoirs cover about 5 acres each. The Maryland Co. has miles of 22″ pipe, with a head of 525′ at its works. The Grass Valley ater Co. has 1½ miles of 22″ and 20″ pipe to the Empire Mine, with 0′ head at hoist and 450′ at mill. This pipe is continued to Massa- usetts Hill through 7,000′ of 20″ pipe, with 770′ head at power- use. A second 20″ pipe from Empire Mine takes waste-water 2 miles the North Star mills, where it is delivered under 280′ head, and at e hoisting works under 232′ head. Another pipe-line of 2,500′ takes ater to the Brunswick Mine, with 275′ head. East of the Brunswick Mine e Independence Mine taps the pipe, under 220′ head. The Orleans . taps the same pipe with 1,000′ of 8″ pipe, taking 16 miner's inches, elivered at the mine under 420′ head. At the same point the Osborne ill Mine takes water through 5,000′ of 6″ to 3″ pipe, delivered under ′ head. The waste-water from the North Star pipe is taken from e mill in a ditch ¾ mile long, 3½′ on top, 2½′ on botttom, and ′ deep, with 6′ grade per mile, carrying 400 miner's inches, to e bulkhead, and through 5,000′ of 18″ to 16″ pipe to the Allison

Ranch Consolidated Mining Co.'s Mine, under 235′ head. F
the Allison Ranch bulkhead the ditch is continued ½ mile to
Omaha Consolidated, whence 900′ of an 8″ pipe conveys water to
Lone Jack Mine, under 85′ head. *The Town Talk branch* extends f
Nevada City to Town Talk, and thence to the reservoir of the G
Valley city waterworks, carrying 1,000 miner's inches, and is 5′ on
3′ on bottom, 3½′ deep, with 14′ grade per mile. It furnishes G
Valley with drinking and irrigating water at a cost of 18 cents per i
for twenty-four hours, measured under 6″ pressure, equivalent to
cu. ft. per minute. *The Third branch* starts from Nevada City, on
south side of Deer Creek, and is 3 miles long, 4′ on top, 3′ on bott
and 2½′ depth, with a 14′ grade per mile, and a capacity of 800 min
inches. It supplies the Champion Mine through 1,500′ of 18″ pipe,
the Home Mine through 1,000′ of 14″ pipe, under 250′ head. *The Fo
branch* starts from a reservoir at Sugar Loaf Hill, runs around Cen
Hill, and goes to the Providence and Mountaineer mines, and is 4½
top, 3′ on bottom, 3½′ deep, and carries 800 miner's inches. Two th
sand feet of 18″ pipe lead to the Providence under 340′ head, and 2,
of 16″ pipe under 330′ head to the Mountaineer. John Spaulding
Nevada City, superintendent.

*Washington Ditch.*—It heads at Fall Creek, running S. of the So
Yuba River, above the Washington Mine, where the water is delive
under 250′ head. It is 5 miles long, 4′ on top, 3′ on bottom, an
deep, with a 14′ grade per mile, and of 800 miner's inches capacity.

## Placer County.

*American Bar Ditch.*—Water is taken from Stitchner's Gulch
conveyed by ditch 3 miles to the American Bar Mine. It has a capa
of 100 inches, running on a heavy grade. American Bar Mining Co
Michigan Bluff, owner.

*Big Dipper Ditch.*—It is 10 miles long, taking water from Shirt-
Cañon, and delivering it at the Big Dipper Mine, where it is used
power. It has a capacity for 250 inches of water, but in summer
fall this is reduced to 75 inches. Big Dipper Mining Co., of San Fr
cisco, owner.

*Breece & Wheeler Ditch.*—This was formerly a large ditch, havin
capacity of 5,000 miner's inches, the water being taken from El Dor
Cañon. It is now out of repair and in disuse. Breece & Wheeler
San Francisco, owners.

*Cedar Creek Ditch.*—It heads on American River, and is 45 miles lo
6′ wide on top, 4′ on bottom, and 3′ deep, with 16′ grade per mile,
of 4,000 miner's inches capacity.

*Dardanelles Ditch.*—It is 9 miles in length, taking water from Volc
Cañon, and delivering it at Dardanelles Mine. With an original capa
of 500 inches, it now will carry only 150, and in summer is reduced
60 or 75 inches. Dardanelles Mine, of Forest Hill, owner.

*Gold Run Ditch.*—It heads in Bear Valley, above Cisco, and is
miles long, 6′ wide on top, 4′ on bottom, and 3′ deep, with 16′ grade
mile, and of 4,000 miner's inches capacity.

*Iowa Hill Ditch.*—It is 8 miles in length, and of 2,000 inches capac
with only 500 inches running in July last. Morning Star Mining
of Colfax, owner.

*liners Ditch.*—This ditch embraces a system 20 miles in length, ging water from Shirt-tail Cañon, and is of 2,000 miner's inches pacity. It is used for mining only. Mayflower Mining Co., of Forest ll, owner.

*outh Yuba Canal.*—This is one of the most important canals in this t of the State. (See Nevada County.) Its sources of supply are th Yuba and Bear rivers. The main line is 60 miles in length, and numerous branches as many more. The capacity is about 5,000 ner's inches. The water is used for mining, power, and irrigation. th Yuba Water Co., of Auburn, owner.

*nion Ditch.*—This is 12 miles long, and takes water from Black Hawk d Young America cañons. It has a capacity of 150 inches. Mayver Mining Co., of Forest Hill, owner.

## Plumas County.

n that portion of Sierra Valley belonging to Plumas County, a numr of artesian wells have been sunk on a belt from one half to three rths of a mile wide, from which flow both hot and cold mineral ters. The depth of these wells varies from 330′ to 1,000′, and the temrature varies from cold drinking to scalding hot. No analyses of the ters were procurable, but they evidently contain sulphur and alkali, d some of them salt and iron. The majority are flowing wells.

## Sacramento County.

The lowlands along the Sacramento River scarcely need irrigation, l the streams flowing into the county from the east afford ample ilities for irrigation where necessary. Moreover, a good supply of terranean water may be obtained in most parts of the valley at a th of 100′ to 150′. A large quantity may be obtained from 20′ to in depth, but that from the deeper strata is generally better. Flowi wells are rare, though but little prospecting has been done to test deep strata. That which flows from the artesian and gas wells at ramento and on the Haggin ranch, like that at Stockton, is too neralized for general use. The "dug" wells of the county are fully scribed in our Xth Report, pp. 496–506. The strata penetrated are y, sand, and gravel, which lie approximately horizontally, and vary character, thickness, and extent.

*Elk Grove Waterworks Well.*—It is at the station; is 12″ in diameter d 170′ deep. Water was struck at a depth of 156′, rises to within 15′ the surface, and yields 150,000 gals. daily by pumping, without terially affecting the supply. The strata penetrated are—

| | |
|---|---|
| Soil | 4′ |
| Compact clay | 4′ |
| Yellow clay with bowlders | 9′ |
| Clay, silt, and bowlders | 33′ |
| Light-blue clay | 12′ |
| Coarse gravel and sand | 4′ |
| Blue clay | 63′ |
| Water-bearing gravel and sand | 24′ |
| Total | 153′ |

The water is principally used for domestic purposes. Other similar wells near Elk Grove are used for irrigation purposes.

*Galt Waterworks Wells.*—There are two 6″ wells, 96′ and 120′ deep, and the water rises to within 18′ of the surface. Fourteen thousand gallons of good water are pumped in two hours daily, for domestic purposes. Surface water may be obtained in that locality 15′ to 20′ in depth, but the second and better water is 40′ to 100′ in depth.

*Interior Development Co.*—See Amador County.

*Natoma Ditch.*—See El Dorado County.

*Orange Vale Irrigation District.*—It is at Orange Vale Colony, on the north side of American River, opposite Folsom, and 6 miles S. of Roseville. It takes water from the American River and Mining Co.'s ditch by an iron pipe 26″ to 11″ in diameter, about 3 miles long, and follows approximately the variable grade of the surface. It irrigates about 600 acres. G. B. Katzenstein, of Sacramento, secretary; E. C. Bedell, of Orange Vale, superintendent.

*Williams, R., Wells.*—These (five) are ½ mile E. of Sacramento, and are said to be 10″ in diameter, and about 150′ deep. The water in the three water-bearing strata rises to within 16′ of the surface. The strata penetrated are thick beds of clay, separated by thinner beds of sand. They were bored to obtain a supply for the city, but found to be more or less unsatisfactory, and are not utilized. The following chemical analysis is by Prof. W. B. Rising, of the State University at Berkeley:

| | Grains per U. S. Gallon. |
|---|---|
| Sodium chloride | 4.760 |
| Sodium bicarbonate | 1.230 |
| Magnesium carbonate | 1.510 |
| Calcium carbonate | 4.024 |
| Calcium sulphate | 0.764 |
| Oxide of iron and aluminum | 0.939 |
| Silica | 3.010 |
| Loss | 0.019 |
| Total | 16.256 |

## San Benito County.

The artesian area is an irregular belt, stretching northward from Hollister toward Gilroy, in Santa Clara County. The wells vary in depth and flow. The strata penetrated are impervious clays, sands, and water-bearing gravels, which lie almost horizontally. Definite records of individual wells are not preserved in many cases, and the information available is both fragmentary and generalized. Wells near San Juan and northward in the San Benito Valley are similar to those about Hollister. There are said to be about 100 artesian wells within an area of about 4 miles square near the boundary of the county, in the vicinity of San Felipe. They are from 2″ to 7″ in diameter, 80′ to 300′ deep, and the larger ones are stated to flow 1,000,000 gals. or more daily each. The flow is generally diminished as the number increases. Small wells are more satisfactory, for the pressure is so great that large wells are hard to control, throw out sand, gravel, and clay, and cause the ground to cave. The flow is generally stronger in winter than in summer, and varies from a surface flow to 20′ piped above surface. Though the water is charged with minerals to some extent, it is suitable and used for irrigation and domestic purposes.

The water from the mountain streams, San Felipe Creek, etc., enters valley along its margin, where the strata are porous, and finds its y into the gravel beds and channels which underlie the impervious ys of the artesian areas.

*Brun's, P., Wells.*—There are four of them, about 1 mile N. of San an, 2″ to 7″ in diameter and 100′ to 123′ deep. The strata penetrated blue and yellow clays, separated by thinner layers of sand and ter-bearing gravels.

*Chase's, Newton, Well.*—It is 1½ miles S. of San Felipe, at about 200′ itude, and is 7″ in diameter, 93′ deep, and flows a stream sufficient irrigate 50 acres of alfalfa, etc.

*Culp's, J. D., Wells.*—There are thirteen of them, on the "tobacco m," ¾ mile S.W. of San Felipe, at about 190′ altitude. They are 2″ 7″ in diameter and 80′ to 112′ deep. They penetrate clay and alluvial liment to the water-bearing gravels, which are generally overlaid by ′ to 18″ of hardpan. Used for irrigation.

*Hollister Irrigation Co.'s Canal.*—It is near Hollister. It is 20′ wide, deep, 2 miles long, and has three main branches of 5 miles each. ater is diverted from San Benito River, about 5 miles S.E. of Hol- er, and irrigates about 7,000 acres of trees, vines, alfalfa, etc. N. C. iggs, of Hollister, secretary; B. F. Gould, of Hollister, manager.

*Hollister Water Co.'s Well.*—This group of three wells is in Hollister. ey are 10″ in diameter, and 200′, 279′, and 356′ deep, respectively. e water, principally from gravels 175′ to 200′ deep, rises to within 2′ the surface. They yield 4,000,000 gals. daily by pumping, which ows no tendency to exhaust them. P. W. Hawkins, of Hollister, retary.

*McMahon's, B., Well.*—It is about 2 miles N. of Hollister. It is 7″ in meter, about 600′ deep, and flows sufficient water for stock purposes. e strata penetrated are heavy beds of clay, with thinner layers of d and gravel.

*Miller & Lux Wells.*—There are a number of artesian wells on their ch north of San Benito River, which are said to be 75′ to 375′ deep, l afford a large quantity of water used for stock.

*Spitts Bros.' Well.*—It is 1 mile W. of San Juan. It is 7″ in diame- , 103′ deep, and flows 1″ over the casing. The strata consist of 98% yellow to black clays, and 8′ of water-bearing gravels.

*Watson's, D. J., Well.*—It is one block south of the waterworks in Hol- er. It is 6″ in diameter, 175′ deep, and flows a fair stream. Cannot exhausted by a windmill pump. The following strata were pene- ted:

| | |
|---|---|
| Soil and clay | 32′ |
| Coarse gravel | 46′ |
| Blue clay | 22′ |
| Compact sand | 12′ |
| Sand and gravel | 40′ |
| Hard, sandy clay | 21′ |
| Water-bearing gravel. | |

*Wilson's, A., Wells.*—There are eight of them, 1½ miles W. of San ipe. They are 3″ in diameter, 120′ to 130′ deep, and flow 16″ to 18″ r the casings. They penetrate three water-bearing strata of sand l gravel, at depths of 75′, 100′, and 120′, which are overlaid by heavy s of impervious clay and marsh sediment.

## San Diego County.

*Cuyamaca and San Diego Flume Co.*—This company owns the la reservoir 60 miles N.E. of San Diego, known as the Cuyamaca Lake, the extensive flume system connecting the reservoir with San Diego. has supplied the ranches of the mountain valleys along its route also the City of San Diego with water for several years.

*Pine Valley Water and Land Co.*—This company was organized for purpose of constructing a dam at the lower end of Pine Valley, at 3,7 elevation. The drainage area of the basin is 46 square miles, and area of the proposed reservoir is 800 acres. It is estimated that it furnish a continuous supply of 1,600 miner's inches of water. Work the dam has not yet been commenced. Eugene Frandzen, of San Di secretary.

*Southern California Mountain Water Co.*—This company has c structed a dam on Otay Creek which is calculated to cover the o valley above for a mile or more; the depth at the dam to be 1 The dam was constructed by building a concrete wall 2′ thick, reach from wall to wall in the cañon on a broad base of concrete resting bedrock. Both above and below this wall has been dumped a quantity of loose rock, quarried from the sides of the cañon. The o flow passes over a low depression between neighboring hills, the d being higher than this depression. A tunnel has been driven thro the hill on the south side of the valley, 600′ above the dam, thro which water will be taken as required, the quantity to be regulated gates. Connecting with the tunnel on the opposite side of the hill is beginning of a large ditch and flume which will be built to convey water to the City of San Diego, where it will be used for domestic p poses, etc. E. S. Babcock, of Coronado, manager.

## San Francisco.

The subterranean water-supply of the San Francisco peninsul very great, and comparatively unimproved. The following is bu portion of the wells bored:

*Almshouse.*—This artesian well flows 6,000 gals. daily into the re voir on Strawberry Hill, at an altitude of 25′ above the well.

*Baldwin Hotel.*—It uses artesian water from its own wells for purposes.

*Baum, Chas.*—His well is at 1705 Powell Street, and the water co not be lowered below the 22′ point by pumping.

*Bradbury, Capt.*—This well affords ample water for the entire nei borhood.

*Center, John.*—This well, at Sixteenth and Folsom streets, supp water for several families.

*City Hall.*—This well supplied abundant water for all purposes u it was accidentally sealed by cement getting into it.

*Crocker Building.*—Its well is 180′ deep, and affords ample water all purposes. Twenty-five thousand gallons are pumped daily. Spr Valley water used for drinking.

*Fagoni, Francisco.*—This well, on the block bounded by Stock Dupont, Greenwich, and Union streets, supplies water for the neigh hood, and is pumped by a windmill and auxiliary steam engine.

*olden Gate Park.*—Five 20″ wells were sunk to an average depth of
and afford by pumping 1,500,000 gals. daily.
*arrold, John.*—This well is on Filbert Street, between Powell and
on, and supplies the brewery, etc.
*owes, Jr., Horace.*—He had a well on Ninth Street, supplying the
ighborhood. Another well was started on an adjacent lot and an
ectual attempt made to pump him out. Finally an arrangement
made with the water company, and the well sealed.
*iller, Dr.*—This well is at the N.W. corner of Broadway and Kearny
ts, and if in order would supply the whole neighborhood.
*ck House.*—Its well affords abundance of water for all purposes, but
water is used for drinking and culinary purposes.
*ewellyn, R.*—His well, on Buena Vista Avenue, is 100′ deep, and
lied all in the vicinity till closed under an arrangement with the
r company.
*ucett.*—These wells, on Shotwell near Eighteenth Street, furnished
000 gals. daily until they were sealed.
*itchell.*—These wells, on Fourteenth Street, between Howard and
ion, are capable of furnishing 500,000 gals. daily.
*alace Hotel.*—These six wells afford ample water for all purposes, but
used for laundry and cleaning purposes only.
*acy, Geo. T.*—This well is at Twenty-fourth and Noe streets, and
lies his own household.
*all, D.*—It is at 407 Greenwich Street. The water comes in such
usion that a pipe had to be put in to carry surplus to the sewer.
*. Nicolas Hotel.*—Its well is 200′ deep, and supplies water for the
e block, 30,000 gals. being pumped daily. When the pumps have
run to their greatest capacity, no diminution was noticeable.

## San Joaquin County.

he artesian area is in the central part of the county, on the east
of the San Joaquin River. Wells are numerous in and about
kton, and here and there southward. The water in many cases is
omineralized for domestic and irrigation purposes, and from the
rity of wells is accompanied by considerable inflammable ("nat-
") gas. Flowing water is generally obtained at 975′ to 1,200′.
artesian and gas wells are 975′ to 2,000′ deep, and penetrate alter-
ng beds of clay, sand, etc. See our VIIth, VIIIth, and Xth Reports,
81, 558, and 549.
*Ishop's, H. B., Well.*—It is 4 miles N.E. of Stockton. It is 8″ in
meter, 1,128′ deep, and is said to flow about 400,000 gals. daily.
*Gattan's, Dr., Well.*—It is 3½ miles N.E. of Stockton. It is 8″ in
meter, 1,010′ deep, and was said to flow about 400,000 gals. daily
h first completed; the flow has greatly decreased.
*Idd's, C. A., Well.*—It is 6 miles S.E. of Stockton. It is 7″ in
eter, 975′ deep, with a light flow, but affords a large quantity of
r for irrigation by pumping.
*Stanislaus and San Joaquin Water Co.'s (San Joaquin Land and Water
. Canal.*—See our Xth Report, pp. 565 and 688. Also see Stanislaus
nty. Water is diverted from the Stanislaus River, 6 miles above
ght's Ferry, and enters this county from the east through the main
tals, which distribute it over a large area of valley lands in the

southwestern part of the county. About 20,000 acres can be irrig in the county, and it is the purpose of the company to increase capacity until more than 100,000 acres can be irrigated. H. W. Co manager; E. C. Cowell, secretary; H. I. Willey, of San Francisco, sulting engineer.

*Stockton Water Co.'s Wells.*—See our Xth Report, p. 550. They on the east side of Stockton, and consist of four flowing and sixty shallow wells. Three are each 8″ in diameter, 975′ to 1,080′ deep, flow 500,000 gals. daily; one is 10″ in diameter, 575′ deep, and h light flow; the temperature of the water from the flowing wells is 7 There are four 8″ wells, 220′ to 240′ deep, from which 4,000,000 have been pumped daily, and the supply is said to be large enoug pump 10,000,000 gals. daily. The following analysis is by Prof. Hilg

| | Grains per Gallon. |
|---|---|
| Sodium carbonate | 4.330 |
| Sodium chloride | 3.410 |
| Chlorine | 2.070 |
| Free ammonia | 0.250 |
| Albuminoid ammonia | 0.124 |

M. S. Thresher, of Stockton, superintendent.

*Woodbridge Canal and Irrigation Co.'s Canal.*—See our Xth Re p. 565. It diverts water from Mokelumne River, near Woodbridge is 15 miles long, averages 35′ on top, 15′ on bottom, and 8′ deep, w grade of $\frac{3}{4}$″ (?) per mile, and irrigates 8,500 acres. M. T. Moses, of Francisco, secretary; B. Laws, of Woodbridge, superintendent.

## Santa Barbara County.

There are about thirty artesian wells in the Santa Maria Valley, Guadaloupe 5 miles westward, at 60′ to 90′ altitude. They are pr pally 3″ in diameter, and 100′ to 125′ deep, though a few are de The water is obtained from beds of gravel and sand, 1′ to 25′ t separated by clays, and lying horizontally. The town of Guadalou supplied with water principally from artesian wells, and the wa forced into elevated tanks by hydraulic rams. In the valley a Guadaloupe an abundant supply of water is obtained from wel pumping. The waters are generally used for domestic, stock, irrigation purposes.

## Santa Clara County.

There are numerous artesian wells in the Santa Clara Valley, which a vast supply of water is obtained for irrigation, domestic stock purposes. They are principally in an area bordering the sou part of San Francisco Bay, and a smaller area S.E. of Gilroy, a each case extending to the inclosing hills. The number of art wells bored in the county probably exceeds 1,000, and is sufficie determine definitely the areas in which flowing water may be obta Unfortunately, however, the records of the strata penetrated have preserved in but few cases. The information available is, ther both second-hand and too fragmentary to delineate definitely the va strata which make up the valley. In general, however, the strat almost horizontal beds of clay, with thinner alternating layers of v bearing sand and gravel. The deeper wells penetrate a numb

ita, and the casings for the most part are perforated at each water-
ring stratum in order to receive the combined supply furnished by
the strata penetrated. The sediments are generally finer toward the
ter of the valley and become coarser, with more bowlders, which
rease in size, and the strata, therefore, are more porous as the border-
foothills are approached. Outside of the area of flowing wells a
d supply of water is generally obtained throughout the valley by
nping. The State law, enacted in 1878, requiring owners of artesian
ls to keep them capped when not using water is very generally
erved.

*Agnews Asylum.*—There are a number of important artesian wells on
asylum ranch, which furnish a large supply of water for irrigation
l other purposes. One bored at the asylum in 1889 is 8″ in diameter,
′ deep, and said to flow 400,000 gals. daily. J. W. Lowe, of San
ncisco, bored one at the asylum in 1895. A 14″ casing extends to a
th of 59′, a 12″ casing extends from the surface to a depth of 735′,
l a 10″ casing from the surface to a depth of 782′, the object being to
arate the different flows. The pressure of the water at the surface is
d to be 21½ lbs. per square inch, and flows more than 600,000 gals.
ly when open to full capacity. The temperature of the water is 80°
and when used in boilers deposits a light sediment. The strata pene-
ted are as follows:

| | Feet. |
|---|---|
| vial sediment | 8 |
| s | 112 |
| d and gravel | 6 |
| e clay | 14 |
| vel | 6 |
| s | 81 |
| ter-bearing sand and gravel | 13 |
| low clay | 10 |
| k sand | 5 |
| s | 100 |
| ter-bearing sand and gravel | 7 |
| e clay | 37 |
| k sand | 5 |
| s | 38 |
| d and gravel | 4 |
| s | 18 |
| d and gravel | 4 |
| low clay | 5 |
| d and gravel | 3 |
| e clay | 3 |
| ter-bearing sand and gravel | 25 |
| s | 28 |
| d and gravel | 5 |
| Clays | 25 |
| Sand and gravel | 7 |
| Yellow clay | 7 |
| Black sand | 3 |
| Clays | 53 |
| Water-bearing sand and gravel | 4 |
| Yellow clay | 8 |
| Water-bearing sand and gravel | 11 |
| Clays | 16 |
| Water-bearing sand and gravel | 4 |
| Yellow clay | 26 |
| Sand | 2 |
| Clays | 22 |
| Sand | 3 |
| Clays | 15 |
| Water-bearing sand and gravel | 5 |
| Clay | 5 |
| Water-bearing gravel | 5 |
| Clays | 16 |
| Water-bearing gravel | 8 |
| Total | 782 |

*Alviso Wells.*—Here are about twelve artesian wells within a radius
¼ mile. They are 7″ in diameter, 230′ to 235′ deep, and flow from
to 2″ over the casings. The strata penetrated by them vary but
le, and are—

| | |
|---|---|
| Clay | 90′ |
| Sand | 29′ |
| Gravel | 3′ |
| Blue and yellow clay | 74′ |
| Sand | 8′ |
| Gravel | 7′ |
| Yellow clay | 15′ |
| Sand and gravel | 7′ |
| Total | 233′ |

*Almshouse Wells.*—There are three artesian wells on the County Al house ranch, 1 mile S.W. of Milpitas. They are 7″ in diameter, said to be 400′, 500′, and 640′ deep, and flow a very great quantit water, which is used for irrigation, domestic, and stock purposes. strata penetrated are heavy beds of clay, separated by thinner bed water-bearing sand and gravels.

*Ballon's, J. Q. A., Well.*—It is 1½ miles N. of San José. It is 7′ diameter, 520′ deep, and flows 9″ over the casing. The strata penetr are principally clay, and a 30″ bed of water-bearing gravel in bottom.

*Boots', Wm., Wells.*—There are six artesian wells on the Boots ranch Coyote Creek, 2 miles W. of Milpitas. Five are 7″ and one is 8′ diameter; they are 250′ to 600′ deep, and flow from 2″ to 5″ over casings. The well at the ranch-house, 600′ deep, has sufficient pres to force the water through a garden hose over a two-story house. penetrates water-bearing gravel of 150′ total thickness, of which first was encountered at 60′ below the surface. The principal wa bearing gravels in that locality lie at a depth of 240′ to 260′, and overlaid by a heavy bed of blue clay, which changes near the botton a hard, yellow, compact clay, which forms a cement-like cap over water. A 34′ bed of sand occurs in one of the wells at a depth of 2 A large redwood log, in good state of preservation, and deposit leaves, fish-bones, etc., were found at considerable depths.

*Burrell's, E., Wells.*—There are four artesian wells on the Bur ranch, 1 mile N. of Agnews. They are 7″ in diameter, 245′, 5 632′, and 450′ deep, and flow ¾″, 3″, 1½″, and 1″ over the casings. strata penetrated are—

| | |
|---|---|
| Alluvial soil | 10′ |
| Yellow clay | 90′ |
| Blue clay | 425′ |
| Water-bearing gravel. | |

The gravel beds in this locality are generally from 4′ to 10′ thick, have a solid clay or cement-like cap, 8″ to 10″ thick.

*Citizens Water Co.*—This company is constructing a canal to ext from near Coyote to San José for furnishing water for irrigation municipal supply. The canal is 10′ wide on top, 7′ on the bottom, 4′ d and has a grade of 2′ per mile. Three miles of the main canal is now c pleted. The water is obtained from an extensive deposit of gra which serves as a natural reservoir, fed by Coyote Creek. It is obtai from fifteen artesian wells in the canal near its head. They are 10′ diameter, 45′ deep, and flow 1″ to 2″ over the casings. E. G. Whee of San José, superintendent.

*Dunahue's, P. J., Wells.*—There are seven wells on the Dunahue ra 2 miles N. of Santa Clara. They are 7″, 10″, and 12″ in diameter, 1 to 250′ deep, and flow a great quantity of water. One bored in Feb ary, 1896, at the ranch-house, is 10″ in diameter, 198′ deep, and flo about 300,000 gals. daily when completed. The strata penetrated blue and yellow sandy clay, and in the bottom is a heavy bed of coa water-bearing gravel.

*Edwards', W. A. J., Well.*—It is on the Alviso road, 3 miles N. of José. It is 7″ in diameter, 285′ deep, and flows 7″ over the casi Three water-bearing beds of gravel were penetrated at 223′, 228′,

deep. That struck at 245′ is 35′ thick and supplies the greater ntity of water. The gravel beds are each overlaid by heavy beds of ervious clay.

*allagher's, A. T., Wells.*—There are six wells on the Gallagher ranch, ile S. of Alviso. Three of them are strong wells, 7″ in diameter, . 670′, and 805′ deep, and flow about 5½″ over the casings. The ta are heavy beds of blue and yellow clay, separated by gravel and d.

*luff's, J. A., Wells.*—These three wells are on the ranch, 2 miles E. of yfield. They are 7″ in diameter, about 400′ deep, and flow about ver the casings. The strata penetrated are—

| | |
|---|---|
| Adobe clay | 15′ |
| Red clay | 25′ |
| Blue clay | 150′ |
| Water-bearing sand | 2′ |
| Red clay | 15′ |
| Blue clay | 46′ |
| Water-bearing sand | 2½′ |
| Yellow clay | 1½′ |
| Blue clay | 62′ |
| Cement | 1½′ |
| Yellow clay | 15′ |
| Blue clay | 14′ |
| Water-bearing gravel | 1½′ |
| Blue clay | 44′ |
| Cement | 2′ |
| Water-bearing gravel | 3′ |
| Total | 400′ |

ier wells on Mr. Huff's ranch are of the same general character as above.

*IcCubin's, R., Wells.*—There are four wells on the McCubin ranch, iles N. of Lawrences. They are 6″ and 7″ in diameter, 175′ to 335′ p, and flow ½″ to 2″ over the casings.

*IcLee's, E., Well.*—It is on Penitentia Creek, at Milpitas. It is 7″ in meter, 264′ deep, and flows 2″ over the casing. The strata penetrated —

| | |
|---|---|
| Alluvial sediment | 10′ |
| Impervious blue clay | 242′ |
| Water-bearing fine gravel | 12′ |

*Iontague's, W. W., Wells.*—His fourteen wells are ½ mile S.W. of hews. No data.

*Ogier's, C. L., Wells.*—There are five wells on Ogier's ranch, 2 miles of San José. They are 7″ in diameter, 275′ to 300′ deep, and flow to 5″ over the casings.

*Ogier's, Mrs. M., Wells.*—There are five wells on Mrs. Ogier's ranch, miles N. of San José. They are 7″ in diameter, 275′ to 308′ deep, l flow about 3″ over the casings.

*Phelan Wells.*—There are four strong artesian wells on the Phelan ch, just north of San José. They are 7″ in diameter, 150′ to 250′ deep, l flow enough for irrigation purposes. One well is said to have flowed over the casing when completed, and is yet a very strong well.

*Polhemus', C. B., Wells.*—There are three wells on the Polhemus farm, ile N. of San José. They are 7″ in diameter. Two flow a small ntity each, and the other is said to be 264′ deep, and is strong enough flow over the casing 20′ above the surface.

*Rea's, Samuel, Wells.*—There are two good artesian wells on the l ranch, 4 miles S.E. of Gilroy. They are 7″ in diameter, and 300′ 345′ deep. The water-bearing gravel in those wells is said to be o laid by 140′ of blue clay.

*Rengstorff's, H., Wells.*—There are six wells on Rengstorff's ranch, miles N. of Mountain View. They are 7″ in diameter. One is 7 deep, and has a light flow; five are 160′ to 300′ deep, and now flow to 2″ over the casings; one at the ranch-house is said to have flowed over the casing when completed, but has greatly decreased.

*Santa Clara Waterworks' Wells.*—A group of four artesian wells w recently bored in the town of Santa Clara, from which water will pumped for municipal purposes. They are each 10″ in diameter, 2 to 235′ deep, and flow 1″ over the casing. The capacity of the pur ing plant is 1,000,000 gals. daily. The storage tanks are on a st tower about 100′ high. The strata penetrated by the wells are—

| | |
|---|---|
| Black adobe | 9′ |
| Black sand | 11′ |
| Blue clay | 13′ |
| Red sediment | 29′ |
| Gravel | 14′ |
| Red clay | 3′ |
| Red sand | 24′ |
| "Cement" | 14′ |
| Gravel | 11′ |
| Blue clay | 18′ |
| Gravel | 7′ |
| Blue clay | 16′ |
| "Cement" | 3′ |
| "Red soil" | 2′ |
| Cement | 2′ |
| "Red soil" | 4′ |
| Gravel and sand | 5′ |
| Blue clay | 8′ |
| "Red soil" | 8′ |
| Gravel | 26′ |
| Clay | 2′ |
| Total | 229′ |

*Swall's, P., Wells.*—There are four wells on this ranch, 1¼ miles S of Mayfield. Two are 6″ and two are 7″ in diameter; they are 17 255′, 322′, and 356′ deep, and flow 2¼″, 1″, 4½″, and 3⅝″ over the casin The strata penetrated are heavy beds of blue clay and thinner layers sand and gravel.

*Wade's, E. E., Wells.*—There are four wells on this ranch, 4 miles of San José. They are 7″ in diameter, 250′ to 260′ deep, and flow fr 2″ to 8″ over the casings.

*Williams', F. E., Wells.*—There are seven artesian wells on his far 2 miles S.E. of San José. They are 7″ in diameter, 80′ deep, and fl about 1″ over the casings. The strata penetrated are heavy beds of bl clay, and water-bearing gravel near the bottom.

*Zook's, T. C., Wells.*—There are two wells, one of which is 2½ miles of Gilroy, 7″ in diameter, 90′ deep, and has a light flow. The other o is at the ranch-house, 3½ miles E. of Gilroy, is 250′ deep, and flo enough for garden and domestic purposes.

## Santa Cruz County.

rom Watsonville artesian wells occur in a narrow belt extending tward to the coast, and vary in depth from 70′ to 256′. Those about tsonville are said to be from 70′ to 100′ deep, and the depth increases he coast is approached. The strata penetrated are clays, sand, and vel, which lie in approximately horizontal layers.

*halmers Wells.*—There are two 10″ wells about 2 miles W. of Watsonle, and said to be about 200′ deep; they flow about ¾″ over the casing. strata penetrated are clays, with thinner layers of sand and gravel.

*oodall Well.*—It is on the coast W. of Watsonville, and was bored a mber of years ago by Anthony Ward, of Gilroy. He states that it is ′ deep, and the strata penetrated are—

| | |
|---|---|
| Sand and gravel | 200′ |
| Clay | 20′ |
| Soft, decomposed granite | 36′ |

s said to have a small flow, which is affected by the tides.

*itchell Well.*—It is about 1 mile W. from Watsonville. It is said to 7″ in diameter, 70′ deep, and flows 1″ over the casing.

*ugar Factory Wells.*—See our Xth Report, p. 625. They are near the tsonville depot, and are said to be from 7″ to 12″ in diameter; from to 100′ deep, and yield by pumping 4,000,000 gals. daily, which is d at the factory. The water is slightly charged with iron.

## Shasta County.

*Baker's, R., Wells.*—There are two on Baker's ranch, in Fall River lley; sunk to a depth of 208′. They have a steady flow of 3 miner's hes; the water is cold, with a slight taste of iron.

*Bowman, J. F.*—In Fall River Valley he carries on a system of irrigan, using a steam-pump to raise 35,000 gals. of water per minute out Pitt River, as it is too low to permit of gravitation works.

*Dry Creek Tunnel and Fluming Co.*—This was formerly the Hayward, Hardscrabble, ditch, and diverts the waters from the Hoover, Eagle, l North Fork of Cottonwood creeks, and the South Fork of Clear ek. The main canal is 24 miles long, 9′ wide on top, 6′ on bottom, l 3′ deep; part of the canal has a grade of 9′ to the mile; the remain- 3′ to the mile. The water is used for irrigation, mining, and power. e capacity of the main canal is said to be 2,000 miner's inches. rchants Exchange Bank, of San Francisco, owner; R. G. Harvey, of o, manager.

*Happy Valley Irrigation Canal.*—The main source of water is from former Hardscrabble mining ditch, starting from the North Fork of ttonwood Creek. The main canal is 15 miles in length, 6′ wide, and deep, with an irregular grade. Of the lateral branches, the main e to Anderson is 10 miles long, 2′ wide on top, 18″ on bottom, 6″ deep, h irregular grade, but averaging 1″ to the rod. Other branches are different farms, and are quite insignificant ditches. An incorporated npany, of San Francisco, owner; R. G. Harvey, of Ono, manager.

## Solano County.

There are no irrigation canals in this county, though water could diverted from Putah Creek, and during a part of the year from sma streams farther south. The subterranean supply of water in the val lands is practically inexhaustible. The so-called "surface" wate obtained at depths of 12′ to 20′, but a supply of better water may obtained at depths of 30′ to 60′. The strata penetrated by wells in valley are alternating horizontal layers of clay and sand, with bowld here and there. For further particulars, see our Xth Report, pp. 661–6

## Stanislaus County.

Stock-raising, agriculture, and fruit-growing are the principal sour of revenue, and the economic mineral resources now developed are minor importance. Undeveloped deposits of coal and manganese said to be in the Coast Range, and a limited amount of quicksilve mined near the western boundary of the county. Considerable la is irrigated on the west and east sides of the San Joaquin River. T large districts are partially developed. Unimproved mineral sprin abound in the foothills on the west side of the county.

Flowing wells (see our Xth Report, p. 682) have been obtained n the San Joaquin River above Hill's Ferry, but a large part of the wa is brackish and sulphuretted, though good water occurs in places. Sm flows have also been obtained locally, near the foothills.

*Crow's, Bedford, Well.*—It is on the west side of the San Joaquin Riv near Crow's Landing. It is 7″ in diameter, 325′ deep, and said to fl about 5,000 gals. daily.

*Hill's Ferry Well.*—It is on the west side of the San Joaquin River, Hill's Ferry, and is 7″ in diameter, 325′ deep, and said to have flowe large quantity. It now leaks through the casing, and only flows abo 6,000 gals. daily. The strata penetrated are sand, sandy clay, and of blue clay, overlying the water-bearing sand.

*Oakdale Irrigation Co.'s Canal.*—See our Xth Report, p. 689. It near Oakdale, and is 9 miles long, 20′ wide on top, 10′ on bottom, and deep, with a grade of 1′ per mile. The dam is broken; the company preparing to divert water into it from the Stanislaus and San Joaqu Water Co.'s canal, 2 miles N.E. of Oakdale. In disuse. J. H. Clay, Oakdale, secretary.

*San Joaquin and Kings River Canal.*—See Fresno County. It is the west side of the San Joaquin River, and enters the county from t south, extending westerly, and irrigates a belt on the east side.

*Stanislaus and San Joaquin Water Co.'s (San Joaquin Land and Wa Co.'s) Canal.*—See our Xth Report, p. 688. It diverts water from the Sta islaus River, at Six-Mile Bar, in Calaveras County, 6 miles above Knigh Ferry, at 355′ elevation. The water flows through two tunnels, numero flumes, and open ditches on the north side of the river to the main poi of diversion, 3 miles E. of Clyde Station, at 170′ elevation. The ma canal is about 18 miles long, and varies greatly in size, grade, a capacity in the different parts. The two tunnels are 1,037′ and 1,04 long, 12′ and 14′ wide, with 6′ depth of water, and grades of 5.4′ a 7.5′ per 5,000′. The flumes are 6′ to 10′ wide, 5′ to 8′ deep, and wi

exception (which is 59′ per 5,000′) their grades are 8′ to 12.3′ per 5,00′; capacity 530 to 850 cu. ft. per second. The ditches are 8′ to 20′ e on the bottom; depth of water, 4′ to 6′; grade, 1¼′ to 5′ per 5,000′, capacity 150 to 300 cu. ft. per second. The flumes and tunnels e a greater capacity than the ditches, in order that they may be arged when necessary. The main canal, as at present developed, is able of delivering 100 cu. ft. or more per second at the main point of ersion, less that diverted by the Farmington and Oakdale laterals, ich will irrigate 20,000 acres or more. When the canal is enlarged ull capacity it will carry about 650 cu. ft. per second, and irrigate ut 130,000 acres, principally in San Joaquin County. The natural ercourses have been taken advantage of as far as possible in devel- ng the system. The total length of canals and main laterals now pleted is said to be about 96 miles. It is the purpose of the pany to supply the Oakdale Irrigation Co. with water, to be diverted m the canal at a point 2 miles N.E. of Oakdale, which will be used irrigation on the south side of the river. The Farmington lateral erts water from the main canal near Knight's Ferry and carries northwestward, part way through Little John Creek, to irrigate the ion about Farmington. H. W. Cowell, manager; E. C. Cowell, sec- ary; H. I. Willey, of San Francisco, consulting engineer.

*Turlock and Modesto Irrigation Districts Canals.*—See our Xth, XIth, XIIth Reports, pp. 688–689, 467–468, and 410. Work has ceased on ir construction, pending litigation.

## Sutter County.

See our XIth Report, p. 469. The Quaternary valley extends over entire county except that part occupied by the Marysville Buttes adjacent foothills, and has an elevation scarcely above the Feather Sacramento rivers, between which it lies. It is made up of heavy ls of clay, separated by water-bearing sand and gravel. When these ter-bearing strata are penetrated by wells, an almost inexhaustible ply of water, suitable for general purposes, is obtained by pumping. flowing wells have been obtained, but deep borings have not been de to determine the possibilities of obtaining them. About Yuba y a good supply of water may be had in most parts at a depth of 40′, ough some wells are deeper, and the strata vary greatly. At Live Oak od water is generally obtained at 25′, though one well bored 1 mile thward is 87′ deep. Westward, as the Sacramento River is ap- ached, the clays become thicker, and the water-bearing strata reach depth of 100′ or more.

## Tehama County.

Considerable land is irrigated in the southern part of the county and the eastern side of the Sacramento River with water diverted from ntelope, Mill, and Deer creeks, principally through small ditches. See r XIth Report, p. 479.

*Sierra V-Flume.*—The flume, with 26″ sides, extends from Red Bluff miles eastward to the lumber mills on the headwaters of Antelope eek, at about 3,400′ altitude, and is used for transporting lumber, etc. erra Lumber Co., of No. 320 Sansome Street, San Francisco, owner; ank Boole, of Red Bluff, superintendent.

*Vina Canal.*—It is on Vina ranch, in the southern part of the county, about 240′ altitude. It is 4 miles long, 30′ wide on top, 20′ on bott and 4′ deep. The water is diverted from Deer Creek, and irrigates 1, acres of alfalfa. T. J. Swing, of Vina, superintendent.

## Trinity County.

*Barmen Ditch.*—It takes water from East Fork of Stewart's Fork second right. The ditch is 4′ on top, 2′ on bottom, 2′ deep, and 7 m long, with capacity of 500 miner's inches.

*Bloss & McClary Ditches.*—These ditches take water from Swift Cre the higher one is 8 miles long, 5′ on top, 2½′ on bottom, and 2½′ de carrying 1,000 miner's inches, and is used for piping; the other i miles long, 7′ on bottom, 3½′ deep, and carries 3,000 miner's inches.

*Brown's Creek Ditch.*—It takes water from Brown's Creek, and i miles long, 5′ on top, 2½′ on bottom, 2′ deep, with a 6′ grade per m and carries 500 miner's inches.

*Conner Creek Ditch.*—It takes the water from Conner Creek, and i mile long, 6′ on top, 3′ on botttom, 2′ deep, and carries 1,000 min inches.

*Cox Bar Ditch.*—It takes water from Cox Bar Creek, is 2 miles long on top, 3′ on bottom, and 2′ deep, and carries 1,000 miner's inches.

*Coyle's Ditch.*—It takes water from Swift Creek, and is 2 miles lo 5½′ on top, 3′ on bottom, 2½′ deep, with a capacity of 1,500 min inches.

*Hayes Ditch.*—It takes water from Cañon Creek, and is 12 miles lo 7′ on top, 4′ on bottom, and 3½′ deep, with a 9.6′ grade per mile, a capacity of 3,000 miner's inches.

*Dutch Creek Ditch.*—It is 1 mile long, 6′ on top, 3½′ on bottom, and deep, with a capacity of 1,000 miner's inches.

*French Creek Ditch.*—It is 6 miles long, 7′ on top, 5′ on bottom, and deep, with a grade of 9.6′ to the mile, and a capacity of 2,500 min inches.

*Grass Valley (Frye) Ditch.*—It takes water from Grass Valley Cre and will be 11 miles long, but only 8 miles are completed. It is 6′ top, 3′ on bottom, and 2′ deep, with a 9.6′ grade per mile, and capac of 1,500 miner's inches.

*Haskins Ditch.*—It takes water from Buckeye Creek, and is 5 mi long, 4′ on top, 2′ on bottom, and 2′ deep, with a capacity of 600 min inches.

*Howe Ditch.*—It takes water from East Weaver Creek, and is 4 mi long, 8′ on top, 4′ on bottom, and 3′ deep, with a grade of 26′ to the mi and a capacity of 4,500 miner's inches.

*Hubbard Ditch.*—It takes water from Reading Creek, and is 8 mi long, 6′ on top, 3′ on bottom, and 3′ deep, with an 8′ grade per mi and capacity of 600 miner's inches.

*Indian Creek Ditch.*—It is 3 miles long, 7′ on top, 3½′ on bottom, deep, and carries 1,000 miner's inches of water.

*Junkans Ditch.*—It takes water from East Weaver Creek, and is miles long, 7′ on top, 4′ on bottom, and 2′ deep, with a 6′ grade per mi and capacity of 1,000 miner's inches.

*La Grange Ditches.*—The first takes water from Rush Creek at prese but will be extended to Stewart's Fork. It is 16 miles long, 7′ on t

3 on bottom, 4′ deep, with a 14.4′ grade to the mile, and a capacity of 00 miner's inches. The second ditch diverts water from West Weaver reek, and is 4 miles long, 6′ on top, 3½′ on bottom, 3′ deep, with a 9.6′ ade per mile, and a capacity of 2,500 miner's inches.

*McGillivray Ditch.*—It takes water from Cañon Creek, and is 12 miles ng, 7′ on top, 3′ on bottom, 3′ deep, with a 10′ grade per mile, and a pacity of 3,000 miner's inches.

*Meade Ditch.*—It takes water from the East Fork of Stewart's Fork econd right), and is 2 miles long, 4′ on top, 2′ on bottom, and 2′ deep, th a capacity of 600 miner's inches.

*Murphy & Madison Ditch.*—It diverts water from Mill Creek, and is miles long, 5′ on top, 2½′ on bottom, and 2½′ deep, with a capacity of 0 miner's inches.

*North Star Ditch.*—It takes water from the East Fork of Trinity ver, and is 3 miles long, 6′ on top, 3′ on bottom, and 2′ deep, with a pacity of 500 miner's inches.

*Paulsen Ditch.*—It diverts water from Rush Creek, and is 4 miles long, on top, 3′ on bottom, and 2′ deep, with a capacity of 1,000 miner's ches.

*Rush Creek Ditch.*—It takes water from Rush Creek, and is 11 miles ng, 5′ on top, 4′ on bottom, and 2′ deep, with a capacity of 6,000 iner's inches.

*Sidney Hill Ditch.*—It takes water from West Weaver Creek, and is 2 iles long, 6′ on top, 3′ on bottom, and 2′ deep, with a capacity of 1,000 iner's inches.

## Tulare County.

The artesian belt principally lies W. of the S. P. R. R. and of Tagus ation. Its eastern boundary conforms approximately with the 280′ ntour line. There are 100 or more flowing wells in the county which e 7″ to 9″ in diameter, 275′ to 700′ deep, and flow 1″ to 6″ over the sing. They furnish vast quantities of water for domestic, stock, and rigation purposes. A number of wells typical of this area are described our XIth Report, pp. 485–489. The strata penetrated are clay, separated by thin beds of sand and gravel, from which the flowing water is btained. The impervious blue clay overlying the water-bearing strata roughout the artesian belt of the San Joaquin Valley varies in thickness and character. It thins out eastward near the railroad, dips a very ttle westward, and is in places 250′ thick, overlaid by alternating layers clay and sand. It is said to grade into "tough blue sand," 500′ thick, T. 23 S., R. 23 E., and very difficult to bore through. A yellow, sandy lay, with thin beds of water-bearing sand, is prevalent, overlying the lue clay toward the western boundary of the county.

Water for irrigation in the valley is obtained from streams flowing nto it from the Sierra Nevada Mountains in the eastern part of the ounty, and from both flowing and pumped wells.

*Merking's, Henry, Well.*—It is in Sec. 30, T. 21 S., R. 24 E., and is 9″ n diameter, 555′ deep, and flowed, when completed, 1″ over the casing. t was recently bored deeper, and flows much less than others in that ownship. Ten strata of water-bearing sands were penetrated, each urnishing a very limited quantity. A 245′ bed of blue clay was struck t a depth of 250′.

*Tulare Irrigation District Canals.*—The two branches divert w from St. John's River, in Sec. 10, T. 18 S., R. 26 E., and Kaweah Ri in Sec. 21, T. 18 S., R. 26 E., and unite in Sec. 23, T. 18 S., R. 26 and form the main canal, with a capacity of 1,000 cu. ft. per secc which is 3 miles long to a point whence the distributing branc diverge. There are about 33 miles of canal, trunk and branches, wh have a general southwest course; and 38,000 acres are included in district, which was organized under the "Wright law." James Akin Tulare, superintendent.

The following ditches divert water from the Kaweah River, n Visalia. They have a combined capacity of 400 cu. ft. of water second, and irrigate land in fifteen townships:

Burch.
Buckley, C. F.
Curtis.
Deep Creek Ditch Co.
Elk Bayou Ditch Co.
Evans.
Evans Extension Ditch Co.
Farmers Ditch Co.
Fleming.
Fulgham Ditch Co.
Goshen or North Prong.
Hauch.
Hyde & Daggett.
Jenning's.
Kelly Ditch Co.
Lakeside Ditch Co.
Modoc.
Oakes.
Packwood Canal Co.
People's Ditch Co.
People's Consolidated Ditch Co.
Persian.
Riparian Owners Ditch Co.
Steinman & Kincaid.
Tulare Irrigation Co.
Tulare Irrigation District.
Uphill.
Watson.
Watson Extension Ditch Co.

The following ditches divert water from the Tule River near Port ville. They have a combined capacity of about 800 cu. ft. of water second, and irrigate about 200,000 acres of land:

| | Capacity, in Cubic Feet. |
|---|---|
| Aikens | 3 |
| Campbell & Moreland Ditch Co. | 20 |
| Daunts | 2 |
| Duncan | 4 |
| Gillam | 3 |
| Hockett Ditch Co. | 10 |
| Lewis | 3 |
| Milo | 6 |
| Mount Whitney Ditch Co. | 10 |
| Osborn & Graham | 6 |
| Pioneer Ditch Co. | 72 |
| Pleasant Valley Ditch Co. | 10 |
| Porter Slough Ditch Co. | 40 |
| South Side Ditch Co. | 300 |
| Tule River Irrigation Co. | 300 |
| Wilcox | 5 |
| 17 small ditches out of South Tule River | 17 |

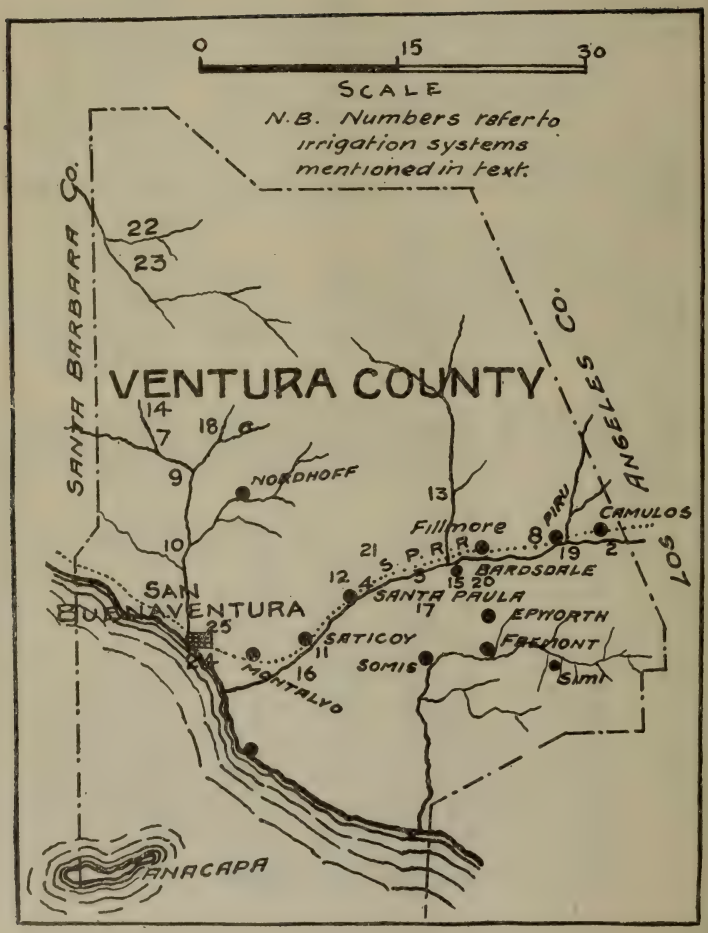
## Tuolumne County.

*Tuolumne Ditch.*—This ditch is 20 miles long, and has a capacity 2,500 miner's inches, the water being taken from the South Fork of t Stanislaus River. It is distributed to mines about the northern part the county, being employed chiefly as a source of power, though al in some small placer mining operations. Tuolumne County Water C of Columbia, owner; J. B. Pownall, of Columbia, superintendent.

## CANALS OF VENTURA COUNTY. (See map, p. 564.)

| Name of Canal. | Point of Diversion. | Length of Main Line. | Size of Canal. | Capacity, in Miner's Inches. | Owner. | Address. |
|---|---|---|---|---|---|---|
| 1. Atmore | Sespe River, near its junction with the Santa Clara River. | 2 miles. | | 200 | M. Atmore | Fillmore. |
| 2. Camulos | Santa Clara River, near Camulos | 2 miles. | 6′ x 2′ | 700 | R. Del Valle et al. | Camulos. |
| 3. Carmichael | Fish Slough, near the junction of the Sespe and Santa Clara rivers. | 3 miles. | | 500 | F. Carmichael | Santa Paula. |
| 4. Farmers | Santa Clara River, between Fillmore and Santa Paula. | 6 miles. | 6′ x 2′ | 700 | Farmers Ditch Co., W. C. Richmond, Secy. | Santa Paula. |
| 5. Fillmore | A cienega on north bank of Santa Clara River, near Fillmore. | 3 miles. | 3′ x 2′ | 300 | Fillmore Ditch Co., F. Bates, Secy. | Los Angeles. |
| 6. San Antonio Water Co. | San Antonio Creek, Ojai Valley | 1 mile. | Flm., 10″ x 9″ | 80 | San Antonio Water Co. | Nordhoff. |
| 7. Miner | Ventura River, between Rice and Sheldon ditches. | 1 mile. | 2′ x 1′ | 150 | J. Miner [Secy. | Nordhoff. |
| 8. Piru | Piru Creek | 2 miles. | 4′ x 2′ | 500 | Piru Ditch Co., L. Gay, | Piru. |
| 9. Rice | Ventura River, at Matilija | 2 miles. | 24″ x 16″ | 250 | R. Rice | Ventura. |
| 10. Santa Ana Water Co.* | Ventura River, junction of Casitas Ck. | Flume, 7 mi. | Flm., 7′ x 2′ | 1,500 | G. W. Chrismen, Pres. | Ventura. |
| 11. Santa Clara Irrigation Co. (Hueneme). | Santa Clara River, at Punta de la Loma | 8 miles. | 8′ x 3′ | 1,500 | J. G. Hill, Pres. | El Rio. |
| 12. Santa Paula W. W. Co. † | Santa Paula Creek, near Mapue S. H. | 2 miles. | 3½′ x 1′ | 375 | C. H. McKevett, Secy. | Santa Paula. |
| 13. Sespe L. & W. Co. ‡ | Sespe River, near mouth of Sespe Cañon | 2 miles. | 5′ x 2½′ | 500 | F. Bates, Secy. | Los Angeles. |
| 14. Sheldon | North Fork of Ventura River | 2 miles. | 16″ x 12″ | 80 | Sheldon | Matilija. |
| 15. South Side Improvement Co. | Santa Clara River, near Fillmore | 5 miles. | 12″ to 8′ x 3′ | 1,500 | J. R. McKee, Secy. | Bardsdale. |
| 16. Vineyard Water Co. | Santa Clara River, ½ mi. W. of Hueneme. | 3 miles. | 5′ x 2′ | 400 | G. C. Powers, Manager | Ventura. |
| 17. Williams, Bard & Spear | Santa Clara River, E. of Fish Slough | 3 miles. | 6′ x 2′ | 400 | J. R. McKee, Secy. | Bardsdale. |
| 18. Barrows & Howe | North Fork of San Antonio Creek | 3,500 feet. | Flume 3″ x 6″ | 20 | Barrows & Howe | Nordhoff. |
| 19. Hargrave & Comfort | Near mouth of Piru Creek | 2 miles. | Flm., 15″ x 16″ | 270 | Hargrave & Comfort | Piru. |
| 20. Stringtown Ditch | Near center of Sec. 32, T. 4 N., R. 19 W., S. B. M. | 2 miles. | 4′ x 1′ | 200 | S. S. I. Co. et al. | Bardsdale. |
| 21. Peralta Ditch and Flm. | On Mapue Creek | 4,100 feet. | Flm., 12″ x 16″ | 200 | Inlio Peralta | Santa Paula. |
| 22. Beckman Ditch | Cuyama River | ¾ mile. | | 90 | | Cuyama. |
| 23. Dorn | Cuyama River | 1 mile. | | 90 | | Cuyama. |
| 24. Wagner | Ventura River, ½ mile above town | Flm., ½ mi. | 16″ x 12″ | 75 | J. B. Warner | S. B. Ventura. |
| 25. Dubbins | Ventura River, 1 mile above town | 1 mile. | 24″ x 12″ | 100 | Mrs. Dubbins | S. B. Ventura. |

*This system supplies Ventura (City) with water. †This system supplies the town of Santa Paula with water. ‡Grade 10 feet per mile.


0
15
30
SCALE
N.B. Numbers refer to irrigation systems mentioned in text.
SANTA BARBARA Co.
LOS ANGELES Co.
VENTURA COUNTY
22
23
14
7
18
9
10
NORDHOFF
13
Fillmore
PIRU
CAMULOS
8
19
2
21
5
P. R. R.
12
4
3
15
20
BARDSDALE
SANTA PAULA
17
SAN BUENAVENTURA
25
SATICOY
11
EPHWORTH
FREMONT
SOMIS
Simi
16
MONTALVO
ANACAPA

## Yolo County.

his county possesses excellent advantages for irrigation and water-
er. The torrential streams, especially Putah and Cache creeks,
y vast quantities of water where they enter the Sacramento Valley,
ch could easily be utilized for both power and irrigation, though
are yet but little improved. The subterranean supply of water
ch may be obtained in the valley by pumping is said to be almost
haustible; for a full description see our Xth Report, pp. 773–780.
ving wells are obtained 1 to 2 miles E. of Woodland at a depth of
t 150,, and water is pumped for irrigation purposes from non-flow-
wells about Woodland.

*dams', D.Q., Ditch.*—It diverts water from the north side of Cache
k, near Capay, and is 4 miles long, 16′ wide on top, 8′ on bottom, 3′
, with a capacity of 20 cu. ft. per second. It is used for irrigating
ls of the Adams estate.

*apay (Cottonwood) Ditch.*—See our Xth Report, p. 792. It diverts
er from Cache Creek, 3 miles above Capay, and irrigates land between
he and Putah creeks, beginning at the foothills and extending east-
d. It is now idle, pending litigation. G. W. Stephens, of Wood-
l, manager.

*apay Valley Ditch.*—See our Xth Report, p. 793. It is in the upper
of Capay Valley. Idle, pending litigation. Spring Valley Water
owner.

*insdale's, J. A., Well.*—It is 2 miles E. of Woodland, and is 6″ in
neter, 148′ deep, and flows enough water for stock purposes. The
ta penetrated are alternating beds of clay and sand.

*oodland Irrigation Co.'s (Moore) Canal.*—See our Xth Report, p.
9 It diverts water from Cache Creek, 8 miles W. of Woodland, and
ses eastward. The main canal is 8 miles long, 35′ wide on top, 20′
he bottom, 6′ deep, with a grade of 3′ to 9′ per mile; its capacity is
3 cu. ft. per second. Used for irrigating a large area of alfalfa, fruit,
vegetables. C. A. Brown, secretary; R. E. Moore, of Woodland,
erintendent.

## Yuba County.

he valley lands are well watered, and a large supply may be had at
reat depth, if pumping is resorted to. No very deep wells have been
d to develop artesian flows. The deepest is a 560′ well at Wheat-
l, the bottom of which is in a heavy bed of blue clay. A supply
be had in most parts of the valley at a depth of about 20′, but better
er is obtained at 50′ to 100′. See our XIth Report, pp. 515-516.

*rown's Valley Irrigation Canal.*—It is located in the lower foothills
he county, at about 300′ elevation, and takes its water from the
th Yuba River, on which it has a water-right of 10,000 miner's
es. The main canal is 27½ miles long, 5′ on the bottom, and 3′ deep,
a grade of 12.8′ per mile. The capacity is 5,200 miner's inches in
upper portion and 3,000 inches in the lower portion. With all
ch ditches the entire length is 100 miles, controlling 44,328 acres of
cultural land, in a rolling country. An incorporated company,
er; T. J. Hibbert, of Brown's Valley, superintendent.

*Excelsior Water and Mining Co.*—This company's main canal st from the South Yuba River, 3 miles below Purdan's bridge, and i miles long, conveying 3,000 inches of water to Smartsville. The dim sions of the canal are 9′ on top, 6′ on bottom, and 2½′ deep, with a grade per mile. The company has branch ditches taking water fr Deer Creek, in Nevada County; the first is 5′ on top, 2½′ on the bott and 2′ deep, with a grade of 15′ per mile, and a capacity of 500 min inches, delivered at Rough and Ready; the second takes water fr Deer Creek through a 16-mile ditch to Newtown, being 4′ on top, 2′ bottom, and 2′ deep, with a 16′ grade per mile, and of 400 inches capac Two miles N. of Rough and Ready another of the company's ditc takes water from Deer Creek, and is 18 miles long, 7′ on top, 5′ bottom, and 2′ deep, with a 15′ grade per mile, and a capacity of 1, miner's inches. Still due N. from Rough and Ready, the company another ditch, taking water also from Deer Creek; it is 14 miles long on top, 4′ on bottom, and 2′ deep, with a 20′ grade per mile, and 1, miner's inches capacity. In connection with the water-rights, the pr erty controls 30,000 acres of land. Dr. Ayer's Estate, of Boston, Ma owner; W. Halstead, of Smartsville, superintendent.

*Marysville Water Co.'s Wells.*—There are two wells at the waterwo each 12″ in diameter. One, known as the sulphur well, is 80′ deep, a the other, known as the soda and iron well, is 180′ deep. About 1,0 000 gals. are pumped daily from the two wells. Alternating strat sand and clay, in horizontal layers, are penetrated. A limited qu tity of gas rises with the water. The following analysis of water fr the two wells was made by W. T. Wenzell, of San Francisco, Mar 1893:

| | Grains per U. S. Gallon. |
|---|---|
| Sodium carbonate | 2.827 |
| Sodium chloride | 4.425 |
| Sodium sulphate | 0.326 |
| Calcium carbonate | 3.422 |
| Magnesium carbonate | 5.497 |
| Ferrous carbonate and alumina | 0.254 |
| Silica | 1.684 |
| Potassium chloride | Trace. |
| Loss | 0.193 |
| Total solids | 18.628 |

The following sanitary analysis was made by Prof. George E. Col of the State University at Berkeley, December, 1892:

| | Grains. |
|---|---|
| Total solid residue, per gallon | 21.600 |
| Chlorine | 1.800 |
| Ammonia, free | 0.013 |
| Ammonia, albuminoid | 0.088 |

# NATURAL GAS.

## Kings County.

Natural gas is said to have been struck in a number of artesian wells ar Tulare Lake, but it is not utilized.

*Jacobs', E., Wells.*—Gas was struck in three or more wells on the obs ranch, in T. 20 S., R. 20 E., at depths of 191′ to 275′.

*Lamberson's, C. G., Well.*—It is in Sec. 12, T. 22 S., R. 22 E., and gas s struck at 470′ to 485′ from the surface.

## Marin County.

Gas escapes from the reef at Point Bolinas, which burns with a smoky flame. The rock is a hard clay shale or indurated clay.

## Sacramento County.

*Sacramento Natural Gas and Water Co.'s Wells.*—See our XIIth eport and Bulletin No. 3, pp. 350 and 11–13. This company bored o wells in the southwestern part of the city, which are 7″ and 14″ in meter, 876′ and 965′ deep, and which flowed a large quantity of tural gas and mineralized artesian water when completed. Neither ter nor gas is now utilized. J. Bassett, of Sacramento, manager.

## San Joaquin County.

No new wells have been completed since our last Report, though one s been started in the northern part of the city. The yield of gas from e old wells is said to remain unchanged. The quantity is sufficient to terially reduce the fuel and lighting expenses in the city. See our VIth, VIIIth, Xth, and XIIth Reports and Bulletin No. 3, pp. 181, 0, 556, 350, and 15.

*Asylum Wells.*—See our Xth and XIIth Reports and Bulletin No. 3, p. 559, 350, and 18. These two wells yield gas for fuel and illumination. Preparations are being made to pump water from one of them h a 12″ centrifugal pump, with a view of increasing the quantity of s. The water has 88° F. temperature, and is used only for bathing. e our Xth Report, p. 549, for analyses of the water. Dr. Clark, of ockton, superintendent.

*Central Natural Gas Co.'s Well.*—See our XIIth Report and Bulletin . 3, pp. 350 and 19. It is on the corner of American Street and ner Avenue. It is 13″ in diameter, 1,500′ deep, and has a light flow. Greenway, of Stockton, superintendent.

*Citizens Natural Gas Co.'s Well.*—See our XIIth Report, and Bulletin . 3, pp. 351 and 19. It is in Stockton, and is 2,061′ deep, and yields 4 000 cu. ft. of gas daily. H. C. Keys, of Stockton, superintendent.

*Court-House Well.*—See our VIIIth, Xth, and XIIth Reports a Bulletin No. 3, pp. 558, 560, 351, and 15. It is near the jail in Sto ton, and is 12″ in diameter at the top, 1,917′ deep, and yields 30,000 cu. of gas daily.

*Crown Mills Well.*—See our VIIth and Xth Reports, pp. 182 and 5 It is at the flour mill in Stockton. It is 9″ in diameter, 1,330′ deep, a yields 7,000 cu. ft. of gas daily, which is used for fuel and illuminati J. M. Welsh, of Stockton, superintendent.

*Grant-Street Well.*—See our Bulletin No. 3, p. 19. It is on Fremc and Grant streets. It is 12″ in diameter, 1,640′ deep, and yields 3,5 cu. ft. of gas daily. Stockton Gas and Electric Co., owner; H. E. Ada of Stockton, superintendent.

*Jackson Wells.*—See our XIIth Report and Bulletin No. 3, pp. 351 a 17. They are at the Jackson Baths, Stockton, and are 12″ in diame and 1,400′ and 1,655′ deep. The gas is sold to Stockton Gas and Elect Co. John Jackson, owner; Frank Hopkins, of Stockton, superintende

*Lathrop Well.*—See our Xth Report and Bulletin No. 3, pp. 560 a 19. It is near Lathrop. It is 8″ in diameter, 1,420′ deep, and is s to yield 2,500 cu. ft. of gas and 300,000 gals. of water daily. Not u now. Robert Shannon, of San Francisco, owner.

*Northern Natural Gas Co.'s Well.*—See our Xth Report, p. 558. It is the northern part of Stockton. It is 13″ in diameter, said to be 2,0 deep, and yields 29,000 cu. ft. of gas and a large quantity of wa daily. George Harnage, of Stockton, secretary.

*Roberts Island Well.*—See our Bulletin No. 3, p. 19. It is on Robe Island, 14 miles W. of Stockton. It is 7″ in diameter, 1,435′ deep, a yielded gas and water. Closed.

*Salmon's, Cutler, Well.*—See our VIIth Report and Bulletin No. 3, 182 and 19. It is 7 miles S.E. of Stockton. It is 7″ in diameter, 1,2 deep, and yields a large quantity of water and gas. The gas is used fuel and illumination.

*St. Agnes College Wells.*—See our Xth and XIIth Reports and Bul tin No. 3, pp. 560, 351, and 18. These two wells are located in Stockt They are 10″ in diameter, 960′ and 1,720′ deep, and yield more th 25,000 cu. ft. of gas daily, which is used for fuel and illumination.

*Stockton Gas and Electric (Natural Gas and Gas Light and Heat) C Wells.*—See our Xth and XIIth Reports and Bulletin No. 3, pp. 557, 3 and 18. This company was organized by consolidating the two old co panies, and owns the "Haas wells," Nos. 1 and 2, the "Stockton G Light and Heat Co.'s well," and the "Grant-Street well," which h recently been extended to a depth of 1,640′. These four wells are s to yield 164,000 cu. ft. daily. The company also receives gas from t two wells at the Jackson Baths. They are all fully described in t above Reports. This company is sinking a 12″ well, at the corner Hunter and North streets, which was 200′ deep in September, 18 A. T. Eastland, of Stockton, secretary; H. E. Adams, of Stockt superintendent.

## Santa Barbara County.

In Summerland there are several wells which supply gas for fuel the residents. The most remarkable feature about them is the press of the gas at comparatively shallow depths. Thus, in a 104′ well "times the pressure was so great that mud and dirt were thrown fr the well 40′ or more into the air." See our Xth Report, p. 601. T

te at which the pressure decreased can be gathered from the record the following wells:

*Cone's Well.*—Two 2½″ wells, 125′ deep, are about 100′ N. of the oulton oil wells and N. of the railroad. In 1893, when first drilled, ıey supplied twenty families with fuel, but in 1895 they yielded sufficient gas for three families only. N. Cone, of Summerland, owner.

*Darling Bros.' Well.*—Two 2″ wells, 102′ deep, are about 1,200′ N.W. the railroad. One of them was drilled in 1891, and when completed ıe gas showed a pressure of 8 lbs. per square inch, and for a year it ıpplied seventeen families with fuel. The pressure gradually diminhed, and in 1895 it was only 1 lb. per inch. The other was completed ı 1892, and has a similar record. In August, 1895, it required both of ıese wells to supply ten families. It is stated that during a north ind these wells yielded a strong flow of gas, but when the wind subdes the gas ceases to flow and a current of air is drawn down the well r several hours. In one instance the latter phenomenon was noticed ) continue for two days, before inflammable gas again flowed from the ell. Darling Bros., of Summerland, owners.

There are several other wells in Summerland which are said to yield ıough gas to furnish more than one family with fuel.

## Santa Clara County.

*New Almaden.*—See our XIIth Report, p. 407. Carbonic acid gas $CO_2$) is obtained in large quantities in a drift on the 575′ level in Santa abel shaft, at New Almaden. It is drawn through a pipe to a receiver, om which it is charged into steel cylinders, under a pressure of 1,300 s. to the square inch, and shipped for use in charging mineral waters, es, etc. Eight hundred thousand cubic feet were shipped in 1895. alifornia Natural Carbonic Acid Gas Co., of San José, lessee; H. C. ister, secretary; G. W. Meyer, superintendent.

## Solano County.

Gas occurs in the vicinity of Potrero Hills, in a bored well, and also capes with water from numerous springs in the tide-water lands. See ır Bulletin No. 3 and Xth Report, pp. 5 and 660.

*Allen's, M., Ranch.*—It is in Sec. 2, T. 4 N., R. 1 W., 7 miles E. of uisun, at tide level. Natural gas escapes with water from twenty or ıore places. Not utilized.

*Hilborn's, E. P., Well.*—It is in the head of a narrow anticlinal valley ı the Potrero Hills, 4 miles S.E. of Suisun. It is 8″ in diameter, 100′ eep, and said to flow 2,400 cu. ft. of gas daily. When lighted at the outh of the well it burns constantly. The strata penetrated are princially sand, which fills the valley; the hard underlying shales were not ached. The gas is not utilized.

*Hurley's, Mrs. M., Ranch.*—It is in Sec. 24, T. 5 N., R. 1 W., 6½ miles . of Suisun. A large quantity of gas is said to come up with water in a umber of places, but is not utilized. James Keyes, of Suisun, manager.

## Tulare County.

A number of artesian wells near Tulare Lake, in the southwestern ırt of the county, yield a limited quantity of natural gas. See our XIth eport, p. 486, and Bulletin No. 3, p. 20.

# PETROLEUM.

## Alameda County.

*Haywards.*—At an early day oil was discovered in Palomares Cañ A 20′ shaft was sunk 6 miles N.E. of Haywards; salt water and a da colored oil raised nearly to the top of the well, both of which disa peared after the 1868 earthquake.

*Livermore.*—See our VIIIth Report, p. 25. Indications of petroleu have been known for many years in Sec. 26, T. 2 S., R. 2 E., about miles E. of Livermore. The earthquake of 1868 caused a spring to fl near the point of disturbance, and the water contained traces of pet leum and considerable gas. A 10′ hole was bored this spring, and is said that a black viscous oil flowed in such quantities that a 5-g can could be filled in two hours. It seems then to have been abandone In 1875 prospecting was recommenced and a 59′ well bored. At 4 water and oil were encountered, and continued to flow until the uncas well caved. In 1886 the Alameda Oil and Gas Co. bored a well 1 deep a few yards north of the first prospect, and obtained water and so oil. The well was then continued to 208′, but no increase was obtaine This well still affords a little water, oil, and gas. The formations pass through are as follows:

| | |
|---|---|
| Soil | 5′ |
| Sandstone | 160′ |
| Conglomerate | 43′ |
| Sandstone | Undetermined. |

These formations dip S.W. at an angle of 30°. The Livermore Oil C bored a 350′ well 8 miles E. of Livermore; no practical results.

During the past twelve months a renewal of the oil interest has be manifested in this vicinity. On J. Brown's place, 4½ miles N.W. Livermore, at 600′ elevation above the sea, a well was started about 1 yds. E. of the former well, which had reached a depth of 208′, and su 26′; both gas and water, carrying a black, oily scum float, was obtaine the formation passed through was a coarse-grained sandstone, the san as in the former well. On J. Barry's place, adjoining, a well has be sunk 65′, through sandstone, which shows gas, but no black oil. C Mrs. Ford's place, 1½ miles W. of Brown's, a former well that gave ind cations of oil, but which had been allowed to cave, has been part cleaned out and a new well started, but not carried to any result.

## Colusa County.

*Long's Claim.*—It is in the S.E. ¼ of Sec. 27, T. 14 N., R. 5 W. Petr leum seeps from shales, which dip at a steep angle, in a ravine tributa to Bear Creek. Preparations are being made to develop the propert M. A. Long & Son, of Williams, owners.

*'athburn's Claim.*—See our Bulletin No. 3, pp. 6 and 89. It is about ile E. of Long's oil claim, in Sec. 26, T. 14 N., R. 5 W. Oil seeps n a number of places near the contact of serpentine and metamor- sed shale. Shallow cuts have been made to collect the oil, and it is l a barrel has been collected daily, but no systematic development been done. J. P. Rathburn & Son, of Williams, owners.

## Contra Costa County.

Bituminous formations are exposed at several places; one is on the ch of J. Miner, about ½ mile E. of De la Viaga station, on the C. & R. R. Here the bituminous shale is exposed in the bed of the Louter- sser Creek, and it is overlaid by a light-colored sandstone, in which re are brine springs and traces of petroleum.

A reconnoissance up the Louterwasser Creek shows that the prevailing of both the shale and sandstone is to the eastward. The following ls are in this vicinity:

*Chandler's Well.*—It is on the Miner ranch and on the south bank of Louterwasser Creek; it was drilled in 1889, penetrated the bitu- nous shale to a depth of about 200′, and is said to have yielded a all quantity of heavy oil and water. Abandoned.

*Cummings' Well.*—It is on the Miner ranch, about ¼ mile E. of the Chandler well. This well was bored by a core drill machine in 1895, d penetrates 20′ of saturated shales, and then sandstone. It is said be over 300′ in depth, and that traces of petroleum were found. Abandoned.

*Sonntag's Well.*—It is on the Allen ranch, about ½ mile E. of the Cum- ngs well. On August 20, 1896, it had reached 100′ in depth; the mation penetrated is light-colored sandstone. Charles Sonntag, of San Francisco, lessee.

## Fresno County.

Petroleum occurs in the foothills skirting the west side of the San Joaquin Valley. The Coalinga District is the only place prospected. Many claims were located, and active prospecting and boring re- mmenced in the spring of 1896. See our XIIth Report and Bulletin . 3, pp. 352 and 56. A limited amount of petroleum flows from the l wells, with water, and is collected in a crude way and used for lubri- ing oil, etc.

A heavy, tar-like petroleum seeps from the side of a ravine 9 miles of Coalinga, and is collected in pits 2′ to 15′ deep. It is heated, ained, and sold for lubricating oil; 25 to 30 gals. are said to be col- ted daily. One man is employed. A. Barrean, of Selma, owner.

*C. C. C. Oil Co.*—Its claims comprise about 3,000 acres, and are situ- d in Sec. 17, T. 19 S., R. 15 E. Developments consist of a 750′ and a 0′ well. Each of them yields about 20 bbls. of oil in twenty-four urs. Canfield & Connon, owners; J. A. Connon, of No. 454 Beaudry reet, Los Angeles, secretary.

*Producers and Consumers Oil Co.*—Its claims comprise about 360 res in Sec. 20, T. 19 S., R. 15 E. Developed by four wells; a 450′ one t pumped, and in which the oil stands within 40′ of the top of the sing; a 605′ one, which yields 20 bbls. in twenty-four hours, and one ll which in June, 1896, was uncompleted. A 900′ one, which is said

to have flowed a *great volume* of oil of low specific gravity for a sh time after its completion; when the gas pressure lessened the v ceased to flow. It is stated that in July, 1896, this well yielded ab 20 bbls. of oil a day. F. Barrett, of Selma, secretary.

## Los Angeles County.

The most important mining operations in Los Angeles County connected with petroleum; the total output for 1895 was 979,695 bb and the price realized was $732,817. The oil-fields which contribu to this total are situated at Los Angeles, Pico Cañon, Newhall, and in Puente Hills.

### LOS ANGELES OIL-FIELD.

The most important event in the annals of the petroleum industry California for 1895–96 is the development of the Los Angeles oil-fiel At Los Angeles the rocky formations constitute a portion of the south slope of an anticlinal fold, which appears to extend eastward from Cahuenga Mountains. The axis of this fold, although rather ill-defin can be found a short distance north of Elysian Park. The prevail dip of the strata forming the south slope of this anticline is a little wes south, modified by subordinate folds or flexures, which, in some pla have locally inclined the strata in an opposite direction. There are t such flexures: one to the north and the other to the south of the wells at Second-Street Park. Owing to the alluvium covering the roc only glimpses of these lines of disturbance can be obtained, but a ca ful study of them leads to the conclusion that they can be traced follows:

The most important line of disturbance can be traced with a cou S. 55° E. from the corner of Vermont and First streets to a point a lit south of First and Glassell streets, thence to a point on Quebec n Ocean View Avenue, and thence to another point about 300′ north f Fourth and Bixel streets. The other line of disturbance can be observ on Burlington near Temple Street. It can be traced to Temple Str near Lake Shore Avenue, and probably the disturbance of the form tion near Bellevue and Victor streets is associated with it. A lit disturbance can be noticed in the middle of the oil-field on Court n Toluca Street.

The rock penetrated by the oil wells at Second-Street Park consist soft, thin-bedded sandstones and sandy clays and shales, which interstratified by thin strata of impure limestone and calcareous stra and two or more strata of oil-bearing sand. This formation is of Pliocene age. The principal stratum of oil-bearing sand is about 1 thick, and it crops out at the surface on Burlington Street, about 300′ of First Street. As a typical illustration of the character of the str penetrated by the oil wells at Second-Street Park, Mr. Doheny sta that a well drilled by the Doheny Oil Co., in the northeastern porti of the oil-field, pierces the following formation:

| | |
|---|---|
| Sandy and clayey strata, with thin strata of hard rock | 650′ |
| Oil sand, interstratified with sandy clay | 125′ |
| Tough clay (putty) | 200′ |
| Oil sand, with water | 3′ |
| Sand, with water | Undetermined. |

The oil sand is more than 100′ thick, the richest portion of it being bout 45′ thick.

Fig. A represents a section across the west end of the oil-field at Second-Street Park. It shows the lines of geological disturbance to the rth and south of the oil-field, the outcrop of the oil sand, and the nt where it is penetrated by a well sunk by Mr. Garbutt, near the

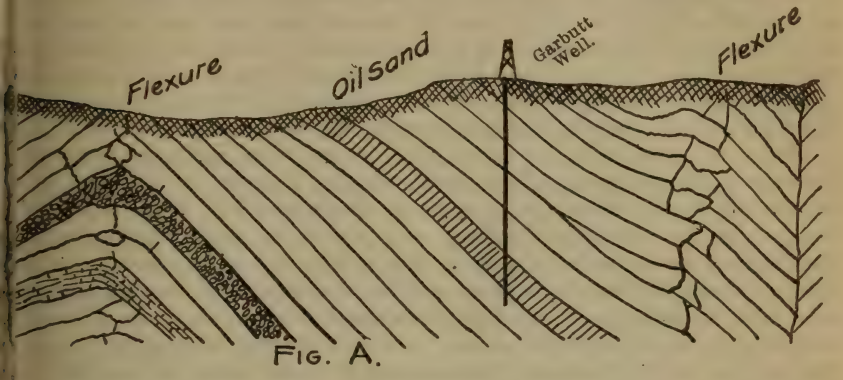



FIG. A.

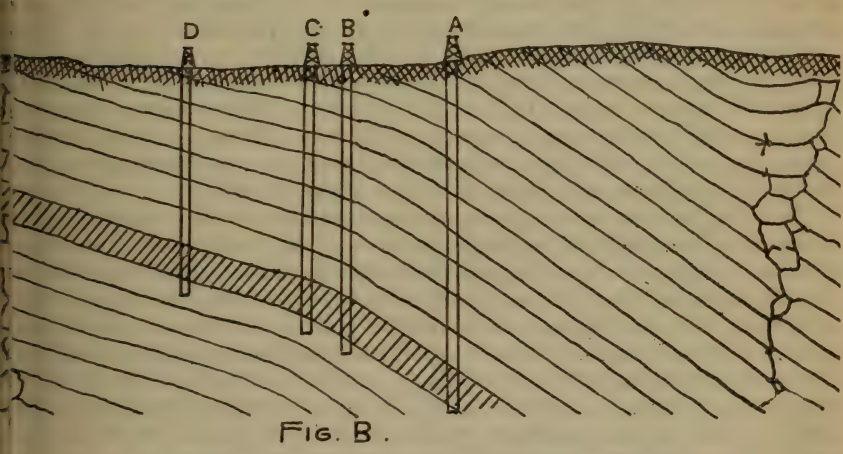



FIG. B.

A. Union Oil Co.'s well on First Street.
B. American Crude Oil Co.'s well.
C. Cole's well.
D. American Crude Oil Co.'s well.

rner of First Street and Union Avenue. Up to April, 1896, this well as the farthest west of any productive well in the district. In this ell the oil sand was struck at a depth of about 855′, which shows that this end of the field the angle of the dip of the oil sand must be out 45°. This angle is very nearly that of the dip of the formation posed near Mr. Garbutt's well, but more than that of the oil sand here it crops out at the surface of the ground on Burlington Street. n the right-hand side of the diagram is the southern line of disturbance, noticeable on Quebec Street. If this line is followed along its trike it would cross Western Avenue near Silver Street, which is a point

shown in this diagram. It has been necessary to make the lines of d turbance well marked on this diagram, but on the surface of the gro they are merely indicated by strata dipping in opposite directions. Burlington Street, about 300′ north of First Street, is the only plac the field where the oil sands crop out at the surface of the ground. reason of this may be explained by Fig. B.

In well A, on the south side of First Street, the oil sand was st at a depth of 1,010′. If a line be drawn from this well across the field, and at right angles to the prevailing strike of the format which is S. 80° E., and if the wells nearest thereto, of which informa could be obtained, are arranged at points where the strike of the st they penetrate cross the line, the profile shown in Fig. B is obtained

From oil sand in well A to oil sand in wells B and C, shows the di be at an angle of about 35°. From oil sand in well C to oil sand in D, the dip shown does not exceed an angle of 16°. With the oil s dipping at this low angle it could not come to the surface before reac the line of disturbance noted in the north end of the field. In w drilled along the northern and southern margins of the oil line, w has been troublesome and has prescribed the width of the oil-bea territory. The operators in the Los Angeles oil-fields agree that main stratum of oil sand thus far explored is from 100′ to 150′ th but that, as a rule, it is not productive all the way through. general opinion of well-drillers appears to be that at least 40′, o average, of the oil sand may be put down as "pay dirt."

Experiments have been made by Mr. Hawley, a civil engineer, a the absorbent powers of this oil sand, and he states that he found t it would absorb about 10% of oil of 14° B. These figures agree v closely with experiments made in Eastern States on the absorb powers of sand. Mr. Doheny also made some experiments on oil s from the Maltman tract, and obtained higher results.

For the purpose of obtaining a concrete idea of the situation, wh is within the range of probability, it may be tentatively admitted as follows: That the Los Angeles oil-field, as far as developments h shown, derives its oil from a stratum of sand carrying about 10% oil; that the said stratum is about 40′ thick, and has an area of ab four million square feet. Such a stratum would contain, in round nu bers, about 2,850,000 bbls. of oil. A careful canvass of all the oil-p ducers shows that in 1895 the Los Angeles oil-field produced 729,4 bbls., or about one fourth of our theoretical total contents of the sa and no inconsiderable amount was produced in 1894.

The question that naturally arises is, how much of the remain 2,000,000 bbls. of oil can be obtained by pumping? There do appear to be many factors on which to base an estimate. It must borne in mind that it is a heavy oil; that the gas pressure in the Angeles wells was never very great. Therefore, the probabilities that even after a well has ceased to yield enough oil to pay for pump every day, providing the wells do not become filled with water choked with sand, small quantities of oil might be pumped from th for quite a long period. Moreover, although there is such a forest derricks at Second-Street Park, they are by no means uniformly tributed over the four million square feet which we, by the way o rough estimate, put down as oil sand.

In the beginning of March, 1896, there were about 330 wells in the

d; allowing to each well, say five thousand square feet, as they were tributed at that date, it would seem that there must be more land in area we calculated yet to be heard from. Much of the unbroken ritory is covered by streets and buildings; all the better for the wells ich are near them, but it seems probable that if a reasonable price n be maintained for the oil, wells will yet be sunk at Second-Street rk which may yield moderate returns. The question naturally sug-sts itself, cannot other strata of oil sand be found by drilling to a ater depth than has yet been reached? The experiment is worth try-g, but the only wells which in April, 1896, had gone far below the main sand have encountered water. With the limitation of the Second-reet Park oil-field thus in sight, the question as to the extension of the -field becomes one of great moment, and the only plan is to follow e strike of the formation which has proved to be oil-producing. As dicated by the arrows in the geological sketch-map of West Los ngeles (see Bulletin No. 11), the prevailing dip of the formation seen at the surface is S. 10° W., although there are numerous errations from that azimuth. The depth at which the oil sand s struck in the different wells leads to the conclusion that, in e main, the strike and dip of the oil sand are similar to that of the cks exposed at the surface. The general direction of the oil line, as dicated by the productive wells, is practically E. and W. Disregard-g any faults there may be in the rocky formation, which for the most rt is covered by alluvium, an inspection of the geological map of est Los Angeles (see Bulletin No. 11) leads to the following conclu-on: If the oil line on which Second-Street Park oil-field is situated extended westward it would pass a short distance south of the Bap-st University. Southwest of the university grounds a formation is posed which corresponds very closely to that at Second-Street Park. his formation rests on a series of sandstones, several strata of which e oil-bearing. On the Maltman tract these sandstones, which show a ickness of several hundred feet, are penetrated by nine wells, ranging om 140′ to 285′ in depth. Each of these wells can be made to yield mething less than 2 bbls. of heavy oil a day; in all the deeper wells ater was encountered. It is evident, therefore, that the oil-yielding rmations extend westward from the Second-Street Park oil-field. he only attempts that have been made to prospect the ter-tory between the Second-Street Park and the Baptist University e as follows: The Fudicker well, situated south of First Street d near what would be Reno Street if it were graded; the Union il Co. well, situated south of First and west of Alvarado Street; one nown as the old Dryden well, which is about 1,000′ N.W. of the pre-ding, and one sunk by Mr. Doheny, near the corner of First and New-all streets. All of these wells proved unsuccessful, and are abandoned; he cause assigned for the failure of the first two being quicksand and ater. Farther southward, near Westlake Park, is the Wilshire well, hich was unsuccessful; and farther westward there are a few very shal-w wells, the Ruhland, which have yielded small quantities of heavy l. From the records of these wells the outlook to the westward does ot seem encouraging. A careful inspection of the territory, however, ads to the conclusion that the Doheny and the Union Oil Co.'s wells e the only prospect wells mentioned that penetrate similar strata to ose which yield the oil at Second-Street Park; that the Doheny well

must be nearly on the outcrop of the oil sand, and that probably well of the Union Oil Co. is not very far south of it.

There does not appear to be any reason why the oil-yielding fo tions should not be followed east from Second-Street Park, but bet it and the river there are very few opportunities of examining the r strata. It is a noteworthy fact, however, that in the water wells w penetrate the drift near the Main-Street bridge, traces of oil contami the water.

The Brook and the Hoag & Silent wells, situated in the north of De Soto Heights, must be very nearly on the strike of the forma penetrated by the oil well at Second-Street Park, but they appear t abandoned. It is said that heavy oil was obtained in the Brook but that it was impossible to case off the water without also casin the oil. Several enterprising citizens have drilled wells in an ende to find other oil lands in the vicinity of Los Angeles, but without cess; in nearly all these wells the strata penetrated showed small q tities of oil. It is said that the cause of failure, in most instances, water and quicksand.

From the foregoing it appears that an extensive oil-yielding forma underlies a portion of Los Angeles; that up to date explorations out of the Second-Street Park oil-fields have not been successful.

A review of the situation leads to the conclusion that the best res will be obtained by following the strike of the productive oil-yiel formation, rather than by sporadic prospecting. When a poin reached where the formation is broken, in the absence of any rock ex ures to prove that the geological disturbance is other than local, sev hundred feet should be passed over and prospecting be recommer still in the direction of what had been previously proven to be the st of the oil-yielding rocks. *Accurate drilling records should be kept, f which a profile of the oil-yielding strata might be made, and by which engineer could trace the course of the oil sand.*

In view of the fact that the direction of the strike and the angle of dip are somewhat irregular, the safest mode of procedure is to prog gradually, and not make too long jumps.

*Asphaltum and Oil-Refining Co.*—Santa Fe Railroad Avenue Ninth Street. The plant consists of two stills of 125 bbls. each, still of 50 bbls., and one still of 30 bbls. The product is asphalt lubricating oil, and distillate for fuel. Four men are employed. Th dore Clark, of Los Angeles, manager.

*Bluett & Mullen.*—Their oil claims comprise about 3,000 acres and situated in the Palmoras Mining District, about 4 miles N. of Cast One well was 400′ deep and incomplete in May, 1896. Bluett & Mul et al., of No. 1 N. Spring Street, Los Angeles, owners; L. W. Johns manager.

*Central Oil Co.* of Los Angeles has leased 3,000 acres of land ab 1 mile N. of Whittier. In April, 1896, one well had been drilled t depth of 700′, penetrating, at a depth of 520′, a stratum of oil sand. W. Neuer, president; R. N. Bulla, No. 39 Temple Block, Los Ange secretary.

*Oil Burning Supply Co.*—Corner Date Street and Alhambra Aven The plant consists of three stills of 100 bbls. each, and storage-tank total capacity of 5,000 bbls. The product is distillate for fuel, asph A B C D and liquid asphaltum, using for fluxing asphaltum which

for roofing. Six men are employed. Harrington Brown, University , Los Angeles, president.

*cific Oil Refinery and Supply Co.*—Its pipe-line extends from Sec- Street Park oil-field to their tanks on Santa Fe Avenue. The consists of 1 mile of 6″ pipe, 4 miles of 4″ pipe, and ½ mile of 3½″ The tankage is 75,000 bbls. H. L. Williams, No. 332 Stimson , Los Angeles, president.

*o Cañon Oil Wells* are situated in what is commonly known as the Cañon oil-field, which is about 7 miles from Newhall. There are t 35 wells in Pico Cañon, 1 in Elmira Cañon, and 1 in Wylie Cañon. e wells vary from 650′ to 1,700′ in depth. (See our Xth Report, 3.) The output of these wells during 1895 was about 150,000 bbls. Pacific Coast Oil Co. and California Star Oil Co., of San Francisco, rs.

*ente Oil District.*—The hills in which the Puente oil wells are situ- are an extension of a line of elevation which can be traced in a easterly direction from the City of Los Angeles. These hills, as at the Puente oil wells, are formed by a series of folds in the rocky ation, which have an easterly and westerly trend. At the base of Puente Hills soft sandstones and conglomerates are found, and in places a white, chalk-like diatomaceous rock, similar to that seen s Angeles, alternates with reddish-brown, sandy strata, forming -colored banks in which the strata vary from a few inches to less an inch in thickness. A small collection of fossils was obtained these formations, which show a preponderance of Pliocene forms.

he higher portions of the Puente Hills are composed of both hard soft sandstones and shales, and these rocks are often separated by , calcareous strata. Were it not for the latter it would be very ult to learn much about the stratigraphy of the Puente Hills, for soft rocks readily disintegrate and become covered with alluvium, e the hard, calcareous strata resist the action of the elements, and any places afford the only clue to the dip of the formation. These er rocks, and the sandstones and shales associated with them, ar to be older and are more disturbed than the soft sandstones and lomerates at the base of the hills. The only organisms noted in e harder rocks are the bones and scales of fish and a few carbonized t remains. There has been so much geological disturbance in the te Hills that it renders the locality an unfavorable one for esti- ng the thickness of the formations named, and prevents a definite lusion as to the conformity or non-comformity of the older and more t strata.

he Puente oil wells are situated on Puente Gulch, and are about 5 s distant in a southwesterly direction from Puente Station on the . R. R., and about 6 miles distant in a northwesterly direction from erton, on the San Diego branch of S. P. R. R.

Puente there are 35 productive wells, from 710′ to 1,750′ in depth. r total output of oil for 1895 was 100,000 bbls. The oil from most e wells has a gravity of from 25° to 30° B., and a few of them yield avy, tar-like oil. The productive wells are situated on the north south sides of Puente Gulch. Our investigation leads to the con- ion that this gulch has been worn along the axis of an anticlinal

fold. The prevailing strike of the oil-yielding strata appears to
N. 70° to 80° E.

Nearly 2 miles in a southeasterly direction from the Puente oil w
is Brea Cañon, where there are other seepages of oil. Between these
places a spur of hills extends in a southwesterly direction. The hig
point of this spur is about 100′ below the boarding-house at Puente,
about 300′ above the most western seepages of oil in Brea Cañon. I
Cañon, like Puente Gulch, is worn along the axis of an anticlinal f
On the northern side a formation is exposed which resembles a port
of the more recent Tertiary formations at Los Angeles. It consist
thin strata of soft, white, chalk-like diatomaceous rock, which alter
with thin strata of reddish-brown sand. This formation dips N. 17°
at an angle of 35°. It appears to rest somewhat uncomformably o
soft sandstone containing numerous white particles. The soft sandst
rests on conglomerate, and the conglomerate on micaceous sandst
which dip N. 25° E. at an angle of 65°. Both the white and red
mation, the soft sandstone and the conglomerate, appear to rest nea
but not quite, conformably on one another. On the south side of B
Cañon are soft sandstones and conglomerates very similar to those
mentioned; they are more or less impregnated with petroleum, and
S. 20° W. at an angle of 70°. A short distance farther south the di
due south at an angle of about 40°.

Along the south side of Brea Cañon there is a series of seepages
heavy oil, which has a course of S. 78° E., and this direction confor
to that of the axis of the anticlinal on which the oil seepages
situated.

The brea, *i. e.*, impure asphaltum, and oil-soaked earth, which
exposed in Brea Cañon, have been used as fuel in the surround
country. At one point an excavation has been made and a tunnel
been run a short distance in the brea. The excavation is filled w
water, with heavy oil floating on it.

Several years ago two or three wells (the Chandler wells) were su
about 4 miles S.E. of the Puente oil wells. They penetrate a formati
similar to that seen in Brea Cañon, and are said to be 200′ or 300′ de
In December, 1894, they appeared to be abandoned. They are said
have yielded 2 or 3 bbls. of heavy oil daily. Around the wells
seepages of heavy oil and deposits of brea. This brea can be trac
from the Chandler wells, a distance of nearly 2 miles, to the m
western oil seepages in Brea Cañon.

No one who has compared the geological formation in Brea Cañ
and the oil-yielding formation in the western portion of Los Ange
can fail to notice their great resemblance in lithological character; b
the collection of fossils from Brea Cañon indicates a somewhat grea
age than does the collection made at Los Angeles. Puente Oil Co.,
Baker's Block, Los Angeles, owner; W. R. Rowland, president; A.
Graves, secretary.

*Puente Oil Co.'s Refinery.*—It is at Chino, San Bernardino Coun
and has a capacity of 200 bbls. of refined petroleum a day. The refin
product consists of illuminating oil of 120° fire test, gasoline 72°
benzine 58° B., and the residues, which are sold as fuel. Puente
Co., owner; A. T. Graves, Baker's Block, Los Angeles, secretary.

*Standard Oil Co. of Pennsylvania* have tanks, situated on Buena Vis
Street, Los Angeles, and the S. P. R. R., of 45,000 bbls. capacity. J.
Harve, of Los Angeles, agent.

*nion Oil Co.*—Its pipe-line extends from the Second-Street Park oil- to Palmetto Street, on the So. Cal. R. R. The plant consists of 5 s of 4″ pipe principally, and a tankage capacity of 32,000 bbls. L. art, Byrne Building, Broadway, Los Angeles, president.

PETROLEUM STATISTICS OF LOS ANGELES COUNTY, 1895.

| | Barrels. | Value. |
|---|---|---|
| Los Angeles oil wells yielded | 729,695 | $437,817 00 |
| Puente oil wells yielded | 100,000 | 100,000 00 |
| Pico oil wells yielded | 150,000 | 195,000 00 |
| Totals | 979,695 | $732,817 00 |

TANKAGE.

| | Barrels. |
|---|---|
| In the Second-Street Park field | 70,000 |
| Outside Second-Street Park field— | |
| So. Cal. Supply Co. | 70,000 |
| Union Oil Co. | 32,000 |
| Puente | 6,500 |
| Standard Oil | 45,000 |
| Oil Exchange | 3,600 |
| Hoffman & Weller | 2,400 |
| Pritchard & Co. | 2,400 |
| S. P. R. R. Co. | 20,000 |
| Total | 251,900 |

he daily yield of oil during 1895 was rather more than 2,000 bbls.; ing the first half of 1896 the daily yield was estimated approxi- ely at 1,400 bbls.

STOCK OF OIL ON HAND AT LOS ANGELES.

| | Barrels. |
|---|---|
| In the field, March 24, 1896 | 37,500 |
| In the field, May 2, 1896 | 38,700 |
| In the field, May 15, 1896 | 34,100 |
| In the field, May 30, 1896 | 37,190 |
| Outside the field, May 30, 1896 | 55,800 |

TATEMENT OF LOS ANGELES CITY OIL WELLS FOR THE YEAR 1895.

(As furnished by owners or agents.)

| Name of Company. | Number of Wells. | Depth. | To First Sand. | Specific Gravity. | Product of 1895. Bbls. |
|---|---|---|---|---|---|
| ms, H. B. | 2 | 550′ | | | 700 |
| erson, J. H., 1807 S. Hope Street | 4 | 700 | | 16.0° B | 10,000 |
| erican Crude Oil Co., Byrne Building | 5 | 770 to 925 | 730′ to 855 | 15.5° B to 14.5° B | 30,000 |
| ler & Last | 6 | 700 to 800 | | 15.0° B | 25,000 |
| ler & Benz | 3 | 1,100 965 986 | | 15.0° B | 12,000 |
| ch, Young & Cochran, 260 Calena Ave., sadena | 2 | 840 800 | 700 None. | 13.0° B | 100 |
| nt, Mrs. Cora A., 149 Kern Street | 1 | 977 | | 14.5° B | 1,200 |
| ley & Co., G. W., 309 Figueroa Street | 1 | 840 | 820 | | 1,500 |
| phy, Forst & Tabor, Edgeware and maha | 2 | 742 765 | 715 690 | | 5,000 |

STATEMENT OF LOS ANGELES CITY OIL WELLS—Continued.

| Name of Company. | Number of Wells. | Depth. | To First Sand. | Specific Gravity. | Pro of I Bt |
|---|---|---|---|---|---|
| Brophy, Morris & Blaisdell, care of Savings Bank and Trust Co. | 2 | 805 | 665 | | |
| | | 775 | 640 | | 4 |
| Burns, John, Court Circle | 2 | 950 | | | |
| | | 880 | | | 2( |
| Carbon Hill Oil and Coal Co., 338 South Broadway | 1 | 911 | 900 | 13.5° B | N |
| Chandler (new) | 1 | 810 | 770 | | |
| Cheney, W. H. E., 1532 Rockwood | 1 | 955 | 600 | 16.0° B | 1 |
| Chicago Crude Oil Co., 309 S. Hope Street | 2 | | | | N |
| Clark, J. R., 2433 Grand Avenue | 1 | 700 | 350 | 18.0° B | 1 |
| Coe, E. W., care of L. A. National Bank | 1 | 650 | 650 | 19.0° B | 1 |
| Cole, A., Belmont and First | 2 | 900 | 825 | 15.5° B | 3 |
| Combination Oil Co., 1319 Omaha Street | 4 | | | | 7 |
| Consolidated Oil Co., 305 State | 2 | 1,035 | | 14.0° B | 7 |
| | | 1,000 | | | |
| Croswell Oil Co., 341 Edgeware | 4 | 700 | 700 | | |
| | | 750 | 750 | | |
| | | 750 | 750 | | |
| | | 906 | 750 | 16.0° B | 6 |
| Cullen, K. P., 213 Nolan & Smith Block | 3 | 1,025 | | | |
| | | 952 | | | |
| | | 981 | 650 | 15.5° B | 5 |
| Daggett & Fletcher, 1342 Calumet Ave. | 3 | 900 | | | |
| | | 788 | | | |
| | | 930 | | 15.0° B | 5 |
| Davis, Cook & Co., care Chamber of Com. | 1 | 1,000 | 400 | 17.0° B | 5 |
| Davisson, Melice & Co., Byrne Building | 2 | 830 | | | |
| | | 835 | 730 | 15.5° B | 7 |
| Davis, Sloan & Beers, 320 Park Place | 4 | | | | 1 |
| Day, A. C., 826 Buena Vista | 1 | 930 | | 14.5° B | 3 |
| Diamond Oil Co., 147 S. Broadway | 3 | | | 16.0° B | 5 |
| Doheny-Connon Oil Co., Stimson Block | 28 | | | | 100 |
| Dryden, W., University Post Office | 2 | 750 | | | |
| | | 989 | 660 | | 6 |
| Eagen, May & Mernier, 1525 Rockwood Ave. | 1 | 810 | | 18.0° B | 1 |
| East Side Oil Co., 530 Stimson Block | 2 | 900 | | | |
| | | 900 | 740 | 16.0° B | 1 |
| Ellsworth & Griggs | 9 | 1=890 | 750 | | |
| | | 6=650 | | 16.0° B | 8 |
| Embody & Stack, 132 S. Broadway | 2 | 865 | | 16.0° B | 6 |
| Embody & Stack | 1 | | | | 4 |
| Empire Oil Co., 130½ S. Spring Street | 4 | 893 | 790 | | |
| | | 740 | 660 | 14.5° B | |
| | | 860 | 790 | to 16.5° B | 15 |
| | | 840 | 770 | | |
| Eureka Oil Co., 302 Smith & Nolan Block | 5 | 800 to 950 | | | 5 |
| Ferguson & Canfield, 373 N. Main Street | 3 | 950 | 800 | 15.0° B | |
| | | 950 | 800 | 15.0° B | |
| | | 850 | 745 | 14.0° B | 2 |
| Ferguson, Mrs. M. L., 5 Phillips Block | 1 | 800 | | | 1 |
| Fowler, R. A., 115 W. Second Street | 1 | 820 | 760 | 15.0° B | 2 |
| Frendberger, P., 321 Metcalf Street | 2 | 620 | | | |
| | | 620 | | 16.0° B | No |
| Green, R., 811 Bonnie Brae | 2 | 915 | | | No |
| | | 907 | | | |
| Greenwood & Barkelow, Toluca and First | 2 | 475 | | | |
| | | 715 | | 15.0° B | 2 |
| Guiteau, H. C., 142 W. Twenty-fifth | 2 | 800 | | 16.0° B | 3 |
| | | 758 | | | |
| Haight, Webster & Co., 401 N. Figueroa | 1 | 935 | 780 | 15.0° B | 5 |
| Hall, Chas. Victor, 220 Central Avenue | 3 | 900 | | | |
| | | 900 | | | |
| | | 750 | 750 | 16.0° B | 8 |
| Harrison, H. H., 316 Park Place | 1 | 860 | 820 | 15.0° B | 3 |
| Henderson, F. B. & Co., 516 Bradbury Blk. | 3 | 700 | | | |
| | | 960 | | | 2 |
| | | 970 | | | |

STATEMENT OF LOS ANGELES CITY OIL WELLS—Continued.

| Name of Company. | Number of Wells. | Depth. | To First Sand. | Specific Gravity. | Product of 1895. Bbls. |
|---|---|---|---|---|---|
| Hbard & Co., 340 S. Edgeware Road | 2 | 760 | | | |
| | | 815 | | | 7,500 |
| fman & Weller, 109 N. Main Street | 3 | 750 | 700 | | |
| | | 850 | 700 | | |
| | | 950 | 700 | 14.5° B | 4,000 |
| ne, J. K., 1354 Court | 1 | 650 | | 19.5° B | 2,000 |
| nson, M. D., 216 W. First | 4 | 800 | | | 20,000 |
| ting Oil Co., 945 Pasadena Avenue | 2 | 981 | 950 | | |
| | | 1,015 | 975 | | 1,800 |
| e Shore Oil Co., 20 Schumacher Block | 1 | 800 | | 17.0° B | 1,500 |
| hrop, Charles, 1017 Temple Street | 2 | 750 | | | |
| | | 850 | | 17.0° B | 20,000 |
| rence, George, 20 Potomac Block | 3 | 710 | | | |
| | | 745 | | 14.0° B | |
| | | 843 | | 14.5° B | 3,500 |
| man & Mills, 213 S. Spring | 4 | 950 | 810 | 15.5° B | 12,000 |
| is, Mrs., 161 Lake Shore Avenue | 2 | 700 | | 16.0° B | 5,500 |
| | | 900 | | | |
| by, C. H., 340 S. Edgeware | 2 | 750 | | | |
| | | 800 | | 15.0° B | 3,500 |
| ma Oil Co., W. Lacy, Pres., 4 Baker Blk. | 11 | | | | 40,000 |
| . Con. Oil Co., Court and Patton | 1 | 720 | 675 | 16.0° B | 2,000 |
| tweiler, S. W., 200 N. Los Angeles St. | 2 | 1,050 | 1,020 | 13.0° B | 1,500 |
| abe, Frank, 302 First Street | 4 | 700 to 1,140 | 700 | 18.0° B | |
| Gray & Warring, Temple and Park Place | 3 | 840 | | | |
| | | 850 | | 15.5° B | 13,400 |
| Gary & Reed, 227 W. Second Street | 2 | 800 | 750 | 16.0° B | 500 |
| Gee, E. M., Lake Shore and State | 1 | 830 | 770 | | 2,100 |
| ntosh, 207 Bradbury Block | 1 | 811 | 750 | | 1,500 |
| er & Zobelein, 444 Aliso Street | 3 | 800 | | 16.0° B | 7,000 |
| hatt, Rich & Schall, 546 Ruth Avenue | 2 | 765 | | 17.0° B | 3,000 |
| | | 850 | | | |
| tin, A. E., 142 Court | 4 | 850 | | 18.5° B | 13,400 |
| Thay, F. L., 1327 Court | 3 | 840 | | | |
| | | 800 | | | |
| | | 800 | | 16.0° B | 12,000 |
| son, R. T., 176 Bonnie Brae | 2 | 860 | | | |
| | | 825 | 740 | 15.5° B | 12,000 |
| Nabauer, J., 1579 Rockwood | 1 | 890 | 890 | 15.0° B | 8,000 |
| Nth, Edward, 1127 Temple Street | 2 | 840 | 780 | | |
| | | 850 | 770 | | 7,193 |
| Oeilley, Mrs. Zella, 631 Washington | 4 | 600 | | | |
| | | 630 | | | |
| | | 757 | 600 | 17.5° B | 3,000 |
| O & Patterson, 147 North Spring | 2 | 600 | | | |
| | | 600 | | 16.0° B | 1,200 |
| Oorne & Stoll, 9 Metcalf Street | 2 | 800 | | | |
| | | 800 | | 16.5° B | 8,000 |
| Pfic Union Oil Co., 115 W. Second St. | 2 | 790 | | | |
| | | 675 | | | 5,000 |
| | | 895 | 1st sand=20.0° B | | |
| Pker, L. C., 136 S. Broadway | 3 | 1,005 | | | |
| | | 1,024 | 2d sand=14.5° B | | 18,700 |
| Pker-Morril Oil Co., W. State and Douglass Streets | 11 | | | 15.0° B | 40,000 |
| Penix Oil Co., 41 Bryson | 3 | 870 | | | |
| | | 930 | | | |
| | | 920 | | 17.0° B | 4,500 |
| Powell, James, 1127 Temple Street | 2 | 810 | | 15.0° B | 9,500 |
| Rmond Oil Co., Third and Main Streets | 7 | 745 | | | |
| | | 825 | 700 | 14.5° B | 12,000 |
| R. Oil Co., 230 S. Spring Street | 3 | 820 | | | |
| | | 900 | 765 | 15.0° B | 7,000 |
| Rinson, Geo. S., 233 W. First Street | 1 | 825 | 515 | 15.0° B | 1,800 |
| Riddy, Burns & Mathay | 2 | 690 | | | |
| | | 715 | | | 5,000 |

STATEMENT OF LOS ANGELES CITY OIL WELLS—Continued.

| Name of Company. | Number of Wells. | Depth. | To First Sand. | Specific Gravity. | Pro of 1 Bb |
|---|---|---|---|---|---|
| Schwartzentahl, Mrs. L., First and Union | 3 | 800 | | 18.0° B | 3 |
| Sheldon, M. N., Second and Broadway | 1 | 1,026 | 600 | 14.0° B | |
| Silent, Chas. E., 150 S. Broadway | 3 | 735 | 680 | 17.0° B | 6 |
| Silent & Callender, Second and Broadway | 1 | 1,100 | 750 | 15.0° B | 2 |
| Skinner & Tonkin | 3 | | | | 3 |
| Southern Cal. Oil Co., 408 S. Broadway | 2 | 894 | | | |
| | | 888 | | | 1 |
| Sterling & Co., 340 S. Edgeware | 2 | 660 | | | |
| | | 800 | | | |
| Strauss, Mrs. A., 233 N. Grand Avenue | 3 | 750 | | | |
| | | 685 | 450 | | N |
| | | 540 | | | |
| Sunset Oil Co., 41 Bryson Block | 7 | 850 | | 15.5° B | 3 |
| Suskin, A. H., 121 S. Broadway | 3 | 850 | 825 | 11.0° B | |
| Thompson, R. C., Omaha Street | 1 | 840 | | 15.5° B | 1 |
| Tomlinson, Mrs. C., 1318 Omaha Street | 1 | 830 | | 15.5° B | 2 |
| Tubbs, G. W., Washington Street | 2 | 700 | | | |
| | | 940 | | | 1 |
| Turner Bros., 206 Patton Street | 12 | | | | 18 |
| Union Oil Co., Byrne Block | 7 | | | | 8 |
| Walker, Rust & Hunt, 342 Metcalf Street | 3 | 780 | | 16.0° B | 10 |
| Wilkinson & Kellam, 147 S. Broadway | 1 | 780 | | 16.0° B | 1 |
| Wing, R. W., 301 Welcome Street | 1 | 840 | | 16.0° B | 3 |
| Wylie | 1 | 810 | 770 | | N |
| Total | | | | | 729 |

## Napa County.

Petroleum and gas are found in a soft gray sandstone in the hills of Napa and Yountville. In Pickle Cañon, 7 miles W. of Napa, a w 30′ deep shows a scum of petroleum on the water. W. H. B. Smede, Napa, owner.

## Santa Barbara County.

The most important mineral industries in Santa Barbara County a asphaltum and petroleum. In 1895 a remunerative oil-field was dev oped at Summerland, 5 miles W. of Santa Barbara, and by June, 18 thirty-eight productive wells had been drilled. As many of them we not completed until the latter part of 1895, the output of oil for th year is smaller than the stated monthly yield indicates. The territo in which productive wells have been obtained at Summerland, exten along the seashore in an easterly direction from Ortega Hill. An exam nation of the outcropping rocks at Ortega Hill, and a comparison the depth at which the oil sand has been struck in different wel demonstrate that the oil-yielding formations dip a little W. of S. at great angle. These formations constitute a portion of an anticlinal fol the axis of which extends along the crest of the first tier of hills whi rise northward of Summerland. The formation penetrated by the wells consists of strata of soft sand or sandstone and blue clay or cla shale; the oil is contained in the sand or sandstone, and in some wel it has been observed issuing from crevices in the clay or clay-shale. all the productive wells north of the railroad the oil sand has be struck at a depth of from 30′ to 100′, and south of the railroad the

l lies deeper, except at the Williams wells, where oil-soaked sand found close to the surface.

he oil hitherto placed on the market was black or dark green, and 0° to 15° B. In a few instances oil of a much less specific gravity been reported. An inspection of the oil-field shows that there are productive wells north of a line drawn N. 80° W. and S. 80° E. ugh the most eastern of the Doulton & Wilson wells. Such a line, general way, corresponds to the strike of the oil-yielding forma-; if it were extended westward it would pass a little south of the Williams well on the summit of Ortega Hill. There is a reasonable ability, therefore, of obtaining productive wells between this line the ocean, and the wells drilled by Mr. Fischer, of Loon Point, v that the oil-yielding formations extend eastward from Summer-l for more than a mile. It is also evident that the oil-yielding for-ions extend southward into the ocean, for not only are productive ielding strata penetrated by the Fischer wells, but at low tide ngs of oil and gas are uncovered on the sea-shore. North of the mentioned there are comparatively shallow wells from which gas is ined, and is used in Summerland for heating purposes.

he formations underlying the strata pierced by the oil wells appear e principally dark-colored shales. These are penetrated by a 1,000′ , drilled by Williams & Easton, about 2,000′ N.E. of the depot, it is a short distance south of the axis of the fold on which Summerland oil wells are situated. Mr. Williams states that the nation is grayish or reddish shale and blue clay, and that at a depth ,000′ the red shale was saturated with oil.

520′ well was drilled by Darling & Turner, on the ridge about ¼ N. of the depot, and at about 200′ altitude. It is probable that this is a little north of the axis of the fold on which the oil wells are ated. Mr. Darling states that shale and sandstone were penetrated, that some of the strata showed traces of oil.

he Occidental and Santa Monica oil wells are in the edge of the ta Ynez Mountains, which rise to the north of Summerland and the pinteria Valley. The formation penetrated by these wells is hard dstone and dark-colored shale, probably of Eocene age.

*lameda and Santa Barbara Development Co.*—It owns five wells at mmerland; three, north of the railroad, are 165′ to 172′ deep, and each ds 5 bbls. in twenty-four hours; two, south of the railroad, are 195′ 210′ deep, and each yields 8 bbls. in twenty-four hours. W. E. ham, of Berkeley, Alameda County, secretary.

*ackus & Craven's Wells.*—These two wells are north of the railroad at mmerland, and are 100′ and 102′ deep. In 1895 they produced 332 bbl. of oil. Oil sand was struck at 70′. Backus & Craven, of Summer-d, owners.

*ole's Well.*—It is a dug well, 4′ in diameter and 90′ deep. It is north he railroad, and yields 3 bbls. of oil per twenty-four hours. S. L. , of Summerland, owner.

*ewlaney's Wells.*—These three wells are north of the railroad at mmerland, and are 4½″ diameter, and 97′ to 123′ deep. The yield is 6 bbls. per twenty-four hours. G. Dewlaney, of Summerland, ner.

*oulton & Wilson Wells.*—The twelve wells north of the railroad are ½ to 5⅝″ in diameter, and 100′ to 150′ deep. When first drilled in 85 they yielded 10 bbls. each in twenty-four hours, but now yield only

6 bbls. each. The four wells south of the railroad are 168′ to 175′ de and each yields 8 bbls. of oil in twenty-four hours.

*Fischer's Wells.*—These two wells are at Loon Point, about 1 mile of Summerland. One of them is a dug well on the seashore, and is 1 deep. Its oil is dark green and rather heavy. The other well is si ated on Loon Point, about 80′ above the ocean. In August, 1895, t well was 185′ deep, and drilling was still in progress. J. K. Fischer Santa Barbara, owner.

*Forrester & Treadwell Wells.*—These ten wells are south of the railro at Summerland, and are 186′ to 222′ deep. Each yields 5 bbls. oil twenty-four hours. Forrester & Treadwell, of Summerland, owners.

*Loomis' Wells.*—These three wells are north of the railroad at Su merland, and are 140′ deep. Each yields 5 bbls. oil in twenty-f hours. C. A. Loomis, of Summerland, owner.

*Moore's Wells.*—These four wells are south of the railroad at Summ land, and are 206′ to 240′ deep. Each yields 7 bbls. oil in twenty-f hours. W. M. Moore, of Summerland, owner.

*Occidental Wells.*—These six wells are in Oil Cañon, about 5 mi N.E. of Summerland, and are 200′ to 1,060′ deep. In all of them mu water was encountered. In August, 1895, only one was being pump and it is said to yield a few barrels of oil a day. Occidental Oil Mini and Petroleum Co., of Santa Barbara, owner; W. S. Day, of San Barbara, secretary.

*Santa Monica Oil Co.'s Well.*—It is about 2 miles N. of Carpinter and is 700′ deep. It is said that an amber-colored oil of 18° B. w struck at a depth of 400′, and that the yield was 8 bbls. in twenty-f hours; also, that when the well was deepened to 700′, flowing water w encountered, which "drowned out" the oil. The formation is hard san stone, which dips S. 10° W., at an angle of 60°. Santa Monica Oil C of Santa Barbara, owner.

*Stevens & Roberts' Wells.*—These three 4½″ wells, north of the railroad Summerland, are 130′ deep, and yield 7 bbls. oil each in twenty-four hou

*Williams' Wells.*—Some years ago (see our VIIth Report, pp. 89 a 90) a 455′ well was sunk on Ortega Hill, and abandoned. On the s shore Mr. Williams has six wells; one 4½′x 5½′ dug well, 50′ deep, yields bbls. oil in twenty-four hours; one 4′x 5′ dug well, 50′ deep, yields 3 bb in twenty-four hours; one well, dug 60′, and drilled to a total depth of and lined with 9⅝″ casing, may be made to yield, the owner says, 1 bbls. oil in twenty-four hours; one 57′ well, 12″ casing, yields 10 bb in twenty-four hours, and one 61′ dug well has yielded several b rels of oil by baling. H. L. Williams, of Summerland, owner.

OIL WELLS IN SANTA BARBARA COUNTY.

| Name of Producer. | Number of Wells. | Product 1895—Bb |
|---|---|---|
| Alameda Development Co. | 3 | 500 |
| Backus & Craven | 2 | 332 |
| Cole, S. L. | 1 | 175 |
| Dewlaney, G. | 3 | 400 |
| Doulton & Wilson | 8 | 3,316 |
| Loomis, C. A. | 3 | 3,000 |
| Occidental | 1 | 500 |
| Stevens & Roberts | 3 | 581 |
| Williams, H. L. | 4 | 8,100 |
| Totals | 28 | 16,904 |

## Santa Clara County.

*Main's, H. H., Well.*—It is on the south side of Los Gatos Creek, 2 miles N.E. of Los Gatos. It is 10″ in diameter, 800′ deep, and oil was obtained from 300′ downward. Gas was struck at 440′ in depth. A limited quantity of heavy black petroleum was pumped, which is suitable for fuel and lubrication. It is not now utilized.

*McPherson (Moody Gulch) Wells.*—See our VIIth, VIIIth, and Xth Reports, pp. 93, 547, and 606. They are in a narrow cañon, 2 miles W. of Alma, at 1,100′ to 1,325′ elevation; fourteen wells have been drilled in the district, and oil is now pumped from six, producing 10 bbls. daily. It is principally sold to the gas-works in Oakland. C. C. Oliver, of Mission San José, lessee; A. McPherson, of Alma, superintendent.

## Santa Cruz County.

In the southeastern part of the county springs of heavy black petroleum issue from shales and sandstones here and there over a considerable area. No wells have been bored to develop the region, however, and no commercial petroleum is produced. See our Xth Report, p. 522.

*Chittenden Tar Springs.*—They are on the Chittenden ranch, near the railroad station, at about 200′ altitude. A very heavy, dark petroleum flows from the contorted and broken shales at the base of a mountain, and is collected in a few shallow cuts which act as reservoirs. The following analysis is by J. Mosheimer, chemist:

| | |
|---|---|
| Water | 6.00% |
| Mineral pitch | 10.00 |
| Lubricating oil | 28.00 |
| Burning oil | 36.00 |
| Naphtha | 11.00 |
| Gasoline | 4.00 |
| Earthy matter | 5.00 |
| Total | 100.00 |

W. Chittenden, of Chittenden, owner.

## Ventura County.

During 1895 the low price of petroleum resulted in very few new wells being drilled, but in this county there is an immense area within which the oil-yielding formations may be followed with a reasonable prospect of success. The principal oil tunnels and wells in Ventura County are situated within a radius of less than 20 miles from Santa Paula. They are: (*a*) In the mountains on the south side of the valley of the Santa Clara River: The Bardsdale, the Torrey Cañon, and the Eureka oil wells. (*b*) In the mountains on the north side of the valley of the Santa Clara River: The wells in Hopper Cañon, the Sespe District, Sulphur Mountain, Sisar Valley (*i. e.*, Silver Thread Oil District), and the O'Hara wells, on the southwest slope of Mount Cayetana. (*c*) There are also a few wells near the localities mentioned, but in 1895–96 they were unproductive. (*d*) On the south slope of Sulphur Mountain there are numerous tunnels which have been run for oil.

The geological structure of this territory presents a series of closely compressed anticlinal folds. These folds are modified by faults, the most important of which have a course nearly coincident with the strike of the formations they traverse. An investigation of the Sespe and Silver Thread districts and Sulphur Mountain shows that the wells are situated on different folds, and that most of the productive wells are near the axis of the folds penetrated. In the localities mentioned, there are two oil-yielding horizons: The uppermost of these, as seen in the Sespe District, consists of dark-colored shales which are interstratified with thin strata of hard limestone resting on drab-colored sandstone. These rocks contain Eocene (*heretofore* classified as Cretaceous B) and Miocene fossils. In the Sespe District they are penetrated by wells at Tar Creek, Four Forks, Brownstone, and the Kentuck claims; in the districts north of Santa Paula, by the O'Hara and the wells at the southern base of Sulphur Mountain. The rocks penetrated by the oil tunnels on the southern slope of Sulphur Mountain also belong to this geological horizon. In the Sespe District this uppermost series of oil-yielding rocks rests on the Sespe brownstone formation. This formation consists of sandstone, shale, and conglomerate, all of which are of a reddish-brown or a black-brown color.

The Sespe brownstone formation rests on a hard, white sandstone composed mainly of white quartz granules. This white sandstone rests on a hard, buff-colored sandstone, which, for the most part, shows a calcareous reaction and contains Eocene (heretofore classified as Cretaceous) fossils. This formation constitutes a second oil-yielding horizon, as is indicated by numerous oil springs which issue from these Eocene rocks. In the Sespe Oil District rocks of this horizon are penetrated by the well of the California Oil Co.

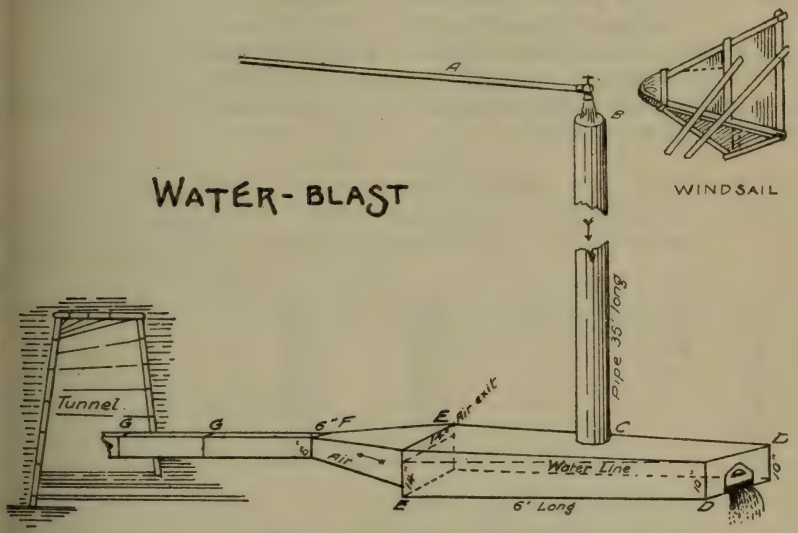
The vertical range of the rocky strata in the territory referred to can be determined by noting the rock exposures in the northern portion of the Sespe District along a line running east from an eminence locally known as Redstone Peak, toward the Piru and Agua Blanca Creeks. A reconnoissance along the line indicated leads to the conclusion that the formations there exposed rest practically conformably on one another, but wherever geological disturbance has been as great as has been the case in the Sespe District, conclusions with regard to the conformity or non-conformity of strata can only be made with safety at points of actual contact.

The Union Oil Co. of Santa Paula handles nearly all the oil produced in Ventura County. It has established a new system of pipe-lines, connecting the oil-field in which its wells are situated with Ventura, where it has a landing for deep-water vessels. A 4″ trunk pipe-line connects Ventura with Sespe. This trunk line is connected with Torrey Cañon and Bardsdale by a 3″ pipe-line, and with the other oil-fields by 2″ pipe-lines. This system comprises, all told, about 100 miles of pipe.

A number of oil tunnels have been run on the southern slope of Sulphur Mountain, about 6 miles N.W. of Santa Paula, and are hereinafter described. The cost of running these tunnels is about $1 50 a foot for the first 100′, and $1 a foot more for every additional 100′, *exclusive* of the cost of timbering. Each foot of tunnel requires one plank, 2″x 12″x 16″, for posts and cap; sometimes lagging is needed. The tunnels are usually 6′ 4″ high, 3′ wide on top, and 4′ on the bottom. A foot-board and a track run the entire length of the tunnel. The tra-

made either of iron or pine scantling, 3″x 4″x 16″; for sleepers, 2″x 12″ plank is used. At the No. 6 Magie tunnel a combination track and foot-board are used. The foot-board is a plank 2′ wide and the track is formed by nailing, broad-side down along the upper edge of the foot-board, 1″x 3″ pine strips. The oil and water flow down a gutter in the floor of the tunnel to a separating tank, usually of 10 bbls. capacity, where the oil rises to the surface of the water, and is drawn off by a pipe-line, which conducts it to a receiving tank. The water escapes from an outlet at the bottom of the tank.

Some of the strata penetrated by these oil tunnels yield much inflammable gas, and various appliances have been used to force air into said tunnels. The apparatus most successfully employed for this purpose is the hydraulic air-compressor or water-blast.




A sheet-iron column, *C B*, about 35′ long, and supported by a light derrick, enters the top of wooden box *D D E E*, which is 6′ long, 14″ wide, and 14″ high at one end and 10″ high at the other. A 6″x 6″ conduit of dressed lumber, *G G F*, or 6″ casing, is connected by a tapering box, *F E*, with the air end of the box *E E D D*, which is provided with a ½″ slot, *H*, with a sliding gate, which regulates the escape of the water. Water is turned into the top of the column from a ½″ nozzle, under a 200′ head. Air is carried down with the water and forced through the tapering box and conduit to the face of the tunnel. The Magie No. 6 tunnel in a few hours fills with gas and it takes the water-blast about half an hour to purify the air so that work can safely be commenced. When work is in progress, the tunnels are illuminated by reflected sunlight, or by incandescent electric light. The blasts are usually discharged by electricity, and air-compressors are used to ventilate workings.

*Abandoned Wells.*—No mention is made herein of wells apparently abandoned.

*Adams Cañon Tunnel.*—It is at the north end of the West Fork of Adams Cañon, and is 900′ long. It penetrates formations similar to

those hereinafter noted at the Pinkerton No. 1 tunnel. It yields ...phuretted water and traces of oil. Union Oil Co., owner.

*Adams Cañon Wells.*—It is said that twenty-nine wells have ...n drilled in this cañon; that they vary in depth from 200′ to 2,780′; ...at they have yielded from 5 to 1,000 bbls. of oil a day; but in June, 1...5, only three wells were being pumped, and they are reputed to yield ...ll told, about 900 bbls. of oil a month. Union Oil Co., of Santa P...la and Los Angeles, owner.

*Aliso Cañon.*—This cañon is about 10 miles N.W. of Santa Paula, ...d five wells have been drilled, it is said from 600′ to 700′ in depth. T...y are small producers and much water accompanies the oil. In M...y, 1895, they were not pumped. Union Oil Co., lessee.

*Bard (Sisar) Wells.*—There are nine wells, 550′ to 800′ deep, ab...t 6½ miles N.W. of Santa Paula and immediately west of the wells belo...ing to the Capital Crude Oil Co. The drillers state that nearly ...ll these wells showed a disturbed and crushed formation, and that in ...e of them several feet of asphaltum was penetrated. Some idea of ...e average life of the wells in the Silver Thread District may be gathe...d from the following table:

BARD WELLS, SILVER THREAD OIL DISTRICT.

| Wells. | Drilled in— | Depth. | Yield when Completed. Bbls. per day. | Yield in J...e, 1895. Bbls. per ...y. |
|---|---|---|---|---|
| No. 2 | 1892 | 350′ | 14 | 5 |
| No. 3 | 1892 | 350′ | 5 | 3 |
| No. 4 | 1894 | 450′ | 8 | 5 |
| No. 5 | 1893 | 420′ | 20 | 6 |
| No. 6 | 1893 | 420′ | 12 | 3½ |
| No. 7 | 1893 | 350′ | 8 | 1½ |
| No. 8 | 1893 | 750′ | 3 | 1½ |
| No. 9 | 1893 | 750′ | 5 | ------ |
| No. 10 | 1894 | 658′ | 3 | 1½ |

Two varieties of oil are obtained from these wells—one of high spec...c gravity from the shallowest wells, and one of somewhat lower spec...c gravity from the deeper wells. Sisar Oil and Asphalt Co., of Huene..., owner.

*Bardsdale Wells.*—They are about 3 miles S. of Fillmore, and consist ...f twenty-two wells. During 1895 they are said to have produced at ...e rate of 3,000 bbls. of oil a month.

*Brownstone (Old Los Angeles) Wells.*—This group is on one of the fo...s of Little Sespe Creek, about 5 miles N. of Brownstone Spur. There ...e eight wells, said to be from 400′ to 800′ in depth. Three of them ...e N.W. of and five of them S.E. of the "forks" of the Little Sespe. T... first three penetrate the upper portion of the brownstone formation, a... are said to be dry holes. The other five penetrate the lower portion ...f the dark-colored shale formation, and are said to yield 1,000 bbls. of ... a month.

*California Oil Co.'s Well.*—It is in Little Sespe District, and 4½ mi... N. of Brownstone Spur. The rocks penetrated are of the Eocene age a... belong to the lower oil-yielding horizon in the Sespe Oil District. Th... well was drilled in 1891, and Superintendent Bradfield states that wh... a depth of 805′ was reached, the well spouted oil over the top of t...

ter k. It filled a 250-bbl. tank in less than half an hour. For one mo h the well spouted oil twice a day, namely, at the hours of 10 ... and 8 P. M.; it then ceased to flow. The 160 bbls. of oil were pu ed out of it every twenty-four hours for nearly one year. The well the became choked with sand and the yield gradually decreased. In 18 this well was cleaned out and it yielded 100 bbls. of oil, when it aga became choked with sand, and as the price of oil was very low the sar was not removed. In 1896 work was resumed on this well in order to epen it. A. J. Weil, of No. 201 Broadway, New York, secretary; O. . Brant, of No. 201 New High Street, Los Angeles, agent.

*pital Crude Oil Co.'s Wells.*—Its eleven wells, 400′ to 750′ deep, are sit ted in the Silver Thread District, about 6 miles N.W. of Santa Pa a. One, the Webber well, was abandoned. In 1895 the ten wells we being pumped, and yielded about 900 bbls. of oil a month, consisting of two grades, *i. e.*, oil of high and low specific gravity.

*ark, John, & Co.'s Refinery.*—It is at Ventura. The plant consists of o stills and one retort, of a total capacity of 60 bbls. in twenty-fo hours. The product is gasoline, naphtha, illuminating and lubricating oils, and asphaltum. This company commenced operations in 18 . G. H. Bartlett, of Ventura, secretary.

*ureka Oil Co.'s Wells.*—These are in Limekiln and Smith's cañons, ab ut 1½ miles S. of Piru. They consist of four wells, 400′ to 750′ deep, ar are said to yield at the rate of 100 bbls. of oil a month. L. A. H dison, of Santa Paula, manager.

*arrell & Kimball's (West) Tunnel.*—It is on the West Fork of Salt M sh Cañon. It is 325′ long and penetrates the following formation:

| | |
|---|---|
| Drift | 45′ |
| Dark-colored shale, with fossils | 75′ |
| Hard stratum of limestone (oil) | 6″ |
| Soft sandstone (with oil), some shale | 112′ |
| Shale, with a few thin sandy strata and a little oil | 80′ |
| Soft sandstone, with a little oil and much gas | 13′ |

In June, 1895, work was still on progress, and the yield was 60 bbls. o oil a month, and sulphuretted water. Farrell & Kimball, of Santa Pula, lessees.

*Farrell & Kimball* also own two other tunnels on the West Fork of S t Marsh Cañon. In August, 1895, each of these tunnels was 140′ in l gth and yielded about 30 bbls. of a dark green oil per month.

*Fortuna Oil Co.'s Wells.*—They are in Hopper Cañon, of the Camulos C District, about 4 miles N. of Buckhorn. They consist of ten wells, f m 90′ to 350′ in depth, and are said to have been very productive from 1 0 to 1894. In 1895 they were shut down, owing to the low price of oil. Fortuna Oil Co., of Santa Paula, owner.

*Four Forks Wells.*—Five wells in Sespe Oil District, about 6 miles N. c Brownstone Spur, were being pumped in 1895, and said to yield, all t d, 40 bbls. of oil a day. They vary from 700′ to 1,100′ in depth. It i said that for a long time they yielded at the rate of 750 bbls. of oil a cy. Two wells were drilled in 1895–96, and are said to be very remu rative. Union Oil Co., of Santa Paula, owner.

*Good's Lower Tunnel.*—It is in Salt Marsh Cañon. The formation p netrated is: Drift, 50′; breccia, 20′; drift, 50′, and from that on to the d of the tunnel the formation is sandstone and dark-colored shale.

At the end of the tunnel there is a spring of sulphuretted water and traces of oil. Good Bros., of Santa Paula, lessee.

*Good's Middle Tunnel.*—It is about 150′ above and 400′ distant from the lower tunnel. It runs 425′ in a N.W. direction. The formation penetrated resembles that in the lower tunnel. Sulphuretted water and practically no oil, is obtained. Good Bros., of Santa Paula, lessees.

*Good's Upper Tunnel.*—It is about 80′ above and over 400′ distant from the middle tunnel, and runs 50′ a little W. of N. The formation is principally dark-colored and somewhat slaty shale. A small quantity of oil was struck in a thin stratum of sandstone.

*Good & Irwin's Tunnel.*—It is situated about 1,000′ a little S. of W. from the Pinkerton No. 1 tunnel. Judging by the dump, the rocks penetrated by this tunnel are very similar to those observed in the Pinkerton lower tunnel. In 1895 it yielded 6 bbls. of heavy oil a month. Good Bros., of Santa Paula, lessees.

*Graham Well.*—It is a short distance W. of Timber Cañon, on the southern slope of Mount Cayetana, about 10 miles N.E. of Santa Paula. It is said that this well penetrates a soft grayish sandstone to a depth of 275′, and that it can be made to yield 6 bbls. of oil daily by pumping. No product in 1895.

*Jones (O'Hara) Wells.*—There are five wells about 5 miles N. of Santa Paula, 430′ to 1,170′ deep. Total yield, about 3,000 bbls. of oil a month. Jones Oil Co., of No. 175 N. Spring Street, Los Angeles, lessee.

*Kentuck Wells.*—Eight wells, varying from 700′ to 730′ in depth, are in Little Sespe District, and about 4 miles N. of Brownstone Sur. They are said to yield at the rate of 4,000 bbls. a month. Dr. J. S. Crawford et al., of Downey Block, Los Angeles, owners; Union Oil Co., lessee.

*Magie Tunnel No. 1.*—The Magie tunnels are on the West Fork of Marsh Cañon. This tunnel is 200′ long, and penetrated sandstone and slaty shale. When completed, in 1891, it yielded 300 bbls. a month. It now produces about 15 bbls. per month.

*Magie Tunnel No. 3.*—It is 270′ long, and the formation exposed is similar to that seen in Magie tunnel No. 6, about 150′ northwesterly. It yields 15 bbls. of green oil a month.

*Magie Tunnel No. 4.*—It is 125′ long, and is situated nearly 400′ N. of tunnel No. 1, and at a somewhat higher elevation. The formation penetrated is earth and drift 113′, and sandstone 12′. It was completed in 1894, when it yielded 30 bbls. of oil a month. In 1895 it yielded 8 bbls. of oil a month. About 800′ N. of the last-mentioned tunnel decomposed slaty shale is exposed, which exhibits signs of solfataric action. This shale is partly covered with breccia, which rests non-conformably on it and has the appearance of not being in place. About 1,700′ still farther west evidences of solfataric action are very conspicuous, and breccia is exposed, which is cemented with scoriaceous material, and some of the rocks appear to have been softened by heat. Others are decomposed and impregnated with alum and sulphur. North of the solfataric line are bleached slaty shales, interstratified with their irregular strata of impure limestone. A small amount of heavy green oil oozes from these shales, and is then collected in a small reservoir. Below are two tunnels, each of which is about 140′ in length, and yields about 15 bbls. of dark green oil per month. The formation resembles that

agie tunnels Nos. 3 and 6. Farrell & Kimball, of Santa Paula, s.

*agie Tunnel No. 6.*—In June, 1895, it was 560′ long, and work was ll eing actively prosecuted therein. The formation penetrated shows f lows:

| | |
|---|---|
| Dark-colored shale, with a few fossils | 220′ |
| Hard stratum of limestone and a little heavy oil | 2′ |
| Light gray sandstone | 120′ |
| Slaty shale | 20′ |
| Sandstone, apparently crushed in strata of 1″ to 18″ in thickness, interstratified with layers of clay-shale and clay ⅛″ to ½″ thick. The last 27′ is traversed by cracks running transversely to the strike of the rocks, and the sandstone is saturated with oil | 180′ |
| Slaty shale | 20′ |
| Hard limestone crushed, yielding oil | 3′ |
| Slaty shale, traversed by small fissures yielding sulphuretted water and oil. | |

h tunnel yields 200 bbls. of green oil a month. R. H. Magie, of a Paula, lessor.

*ajor Moultre Tunnel.*—It is 650′ long, and is situated at the north of a gulch which extends in a northerly direction from the East o of Adams Cañon. It was run to tap a 300′ well which, when drilled, yielded at the rate of 30 bbls. a day. This tunnel, near its penetrated strata which show evidence of solfataric action where e crop out at the surface. The formation is as follows:

| | |
|---|---|
| Crushed shale | 100′ |
| Reddish shale | 50′ |
| Slaty shale, with thin strata of hard limestone, yielding 1 bbl. brown oil a day | 50′ |
| Hard shale and limestone, yielding sulphuretted water and much gas | 200′ |
| Hard shale, with flinty nodules (green oil) | 100′ |
| Black slaty shale in thin strata | 50′ |
| Shales, with 18″ stratum of slate breaking in thin lamina | 100′ |
| Slaty shale, yielding oil and gas. | |

; said that when this tunnel was completed, in 1889, it yielded 0 bbls. of oil a month. In 1895 it flowed at the rate of 50 bbls. a th. Union Oil Co., owner.

*arker & Orne Tunnel.*—It is situated in Mud Creek Cañon, and was pleted in 1890. It is said to be 100′ long, and to have yielded 60 . of heavy oil a month. This tunnel is now partly caved and no lows from it. C. A. West, of Santa Paula, owner.

*inkerton (Lower) Tunnel No. 1.*—It is in one of the North Forks of Marsh Cañon. It is 320′ long, and when completed, in 1894, yielded bbls. of oil a month; in 1895 it yielded 30 bbls. of oil of high specific vity. The principal source of oil is a sandstone stratum, 8½″ thick, ch is traversed by crevices ⅛″ to ¼″ wide. The oil is accompanied gas and sulphuretted water. Between this sandy stratum and the of the tunnel, oil and sulphuretted water seep from cracks in the ls and floor of the tunnel. W. Pinkerton, of Nordhoff, lessee.

*'inkerton Tunnel No. 2.*—It is about 400′ N. 15° W. from the No. 1 nel, and about 100′ higher up the mountain. It is about 700′ g, and was completed in 1892. The formation is shale and soft sand- ne; the shale is more slaty than in tunnel No. 1, and some strata tain the bones of fish. There is much gas. Oil, black, was first ountered in small quantities 125′ from the mouth. At 400′ a heavy wn oil was struck at the contact of shale and sandstone. At first

this oil seepage yielded 4 bbls. of oil daily. At 630′ a thin strat loose sand yielded much gas and sulphuretted water; the strat nearly vertical. For the next 10′, a light green oil of low specific gr oozes from thin sandy strata, which are separated by slaty shale. end of the tunnel a slaty shale yields much gas and a little green oil. the first year after its completion this tunnel yielded 150 bbls. of month. In 1895 the yield was 90 bbls. of oil a month.

*Pinkerton Tunnel No. 3.*—It is also known as the *Jefferson*, and is long, and was completed in 1893. It appears to be run in consoli drift, or decomposed rock. A green oil was struck at 100′, and a oil seeps out here and there throughout the entire length of the tu at the end of which a 35′ hole has been drilled. When complet yielded 210 bbls. of oil a month; in 1895 it yielded 50 bbls. of month.

*Pinkerton Tunnel No. 4.*—It is about 15′ N.W. of No. 3, and abou higher on the mountain. It is 200′ long, and was completed in The formation is slaty shale. There is a 45′ drill-hole at the end c tunnel, which yields 30 bbls. of rather heavy green oil a month water.

*Pinkerton Tunnel No. 5.*—Also known as the *Orne* tunnel. It is a 200′ N. 25° E. of No. 4, and 40′ higher. It is 700′ long, and was fini early in 1895. It penetrates soft sandstone and slaty shale. At 1 heavy green oil was struck in sandstone. Between 300′ and 400′ b the mouth a green oil of low specific gravity oozes from strata of s shale. At the end of the tunnel, the shale is crushed and yields s phuretted water and brown oil of high specific gravity. At the e the tunnel a 25′ hole has been drilled and yielded a little oil and s phuretted water. After its completion, this tunnel yielded 120 bb oil a month for three months. In 1895 the flow was 50 bbls. a m As before mentioned, the end of this tunnel penetrates crushed r which underlie the solfataric line previously described.

*Pinkerton Tunnel No. 6.*—It is 400′ N. 25° W. of and about 100′ hi than tunnel No. 5. It is 75′ long, known as the old *Adams* tunnel, said to have been completed in 1880. The formation appears to be s shale, but it is much decomposed; in many places the surface o walls and the timber are coated with small, flat, lustrous crystals, w appear to be thickest where the gas is the strongest; they were subm to Prof. C. G. Schneider, the Assistant Mineralogist of the Calif State Mining Bureau, who pronounced them to be a hydroca mineral. Similar crystals can be found in other old working Sulphur Mountain. Before No. 5 tunnel was completed the old tunnel yielded 30 bbls. of heavy oil a month. In 1895 it yielded tically nothing.

*Pinkerton Tunnel No. 7.*—It is 200′ long and has been run a shor tance N. of the No. 5 tunnel. The formation is slaty shale. A green oil was struck at the end of this tunnel. When first complet yielded 120 bbls. of oil a month; in June, 1895, it yielded about 15

*Salt Marsh Cañon Wells.*—These nine wells are about 5 miles N.W Santa Paula, and are from 250′ to 1,600′ in depth. It is said that formation is dark-colored shale and sand. They were drilled in 1 and said to have yielded 200 bbls. of oil a day for more than a year that the yield gradually diminished until 1895, when three wells

pumped, amounting, all told, to about 300 bbls. of oil a month. Oil Co., owner.

*Scott & Gillmore Wells.*—These seven wells, 300′ to 1,100′ deep, are 5 miles N.W. of Santa Paula. Total yield, about 100 bbls. of oil a h. The oil varies from a light brown oil to maltha; the light oil, *i. e.*, of the lowest specific gravity, is obtained from strata are the lowest in point of vertical range of any penetrated by irm. Scott & Gillmore, owners; Union Oil Co., lessee.

*Sespe Creek.*—It is about 8 miles N. of Brownstone Spur, and here y-one wells have been sunk from 700′ to 1,100′ in depth. For many this group of wells has been productive; in 1892 they yielded at ate of 1,500 bbls. a month; in 1895 only five of them were being ped, and said to yield about 900 bbls. of oil a month. Union Oil owner.

*Grey Cañon Wells.*—They are about 3 miles S. of Piru. Nineteen were drilled. During 1895 five of them were pumped, and said to produced at the rate of 4,500 bbls. of oil a month. Union Oil Co., r.

*Union Oil Co.'s Refinery.*—It has removed its refinery from Santa a to Oleum, on San Pablo Bay, in Contra Costa County, where it erected a new refinery, which has a capacity of 12,000 bbls. a month. oil is transported both by land and water from Ventura. The ucts are gasoline, naphtha, illuminating oil, and asphaltum.

*Union Oil Co.'s (No. 6 Lease) Wells.*—They are in the Silver Thread District, about 6½ miles N.W. of Santa Paula. They embrace nine s, from 60′ to 900′ deep. In June, 1895, eight of them were being ped; said to yield about 600 bbls. of oil a month. Three kinds of re obtained: a heavy black, a brown, and a green oil. The black s obtained from the shallow wells. Union Oil Co., owner.

*Wheeler Cañon Tunnels.*—It is said that there are three 600′ tunnels Wheeler Cañon, yielding 300 bbls. a month. Union Oil Co., owner.

*Wheeler Cañon Wells.*—They are about 12 miles N.W. of Santa Paula. said that five wells, 200′ to 900′ deep, were drilled in this cañon; that the chief oil-bearing stratum was struck at 90′ in depth. Also, the best well was only 250′ deep and that it yielded 30 bbls. of oil a for six months, and then went dry. Union Oil Co., owner.

# QUICKSILVER.

## Colusa County.

*Buckeye Mine.*—See Wide Awake Consolidated.

*Central Mine.*—See our XIth and XIIth Reports, pp. 185 and 359. It is immediately east of the Manzanita Mine, in Sulphur Creek District, at about 2,100′ elevation. Cinnabar occurs in seams in altered serpentine, and shows a good prospect where the rock is partly disintegrated near the surface. It is concentrated in sluice-boxes and the concentrates retorted. Idle. G. W. Northey and W. E. York, of Sulphur Creek, owners.

*Elgin Mine.*—See our XIIth Report, p. 359. It is 3 miles N. of Sulphur Creek. Idle, but the lessees, Oeldart & Smith, of Sulphur Creek, expect to resume work soon. J. H. Moore, of San José, owner.

*Empire Mine.*—See our XIth Report, p. 186. It is in Sec. 28, T. 1N., R. 5 W., on the south side of Sulphur Creek. The workings consist of a 168′ tunnel, in which a small amount of cinnabar can be seen. Four men are employed developing. W. E. York and T. Pearson, of Sulphur Creek, owners.

*Farris (Oriental) Mine.*—See our XIIth Report, p. 359. It is in Sulphur Creek District. Idle. J. H. Moore, of San José, owner.

*Manzanita Mine.*—See Manzanita, under Gold. It is in Sulphur Creek District, and was formerly worked for both gold and quicksilver, but recently it is worked for gold only.

*Rathburn Mine.*—See our XIth and XIIth Reports, pp. 181 and 359. It is on "Dead Shot" Ridge, on the west side of Bear Valley. The workings consist of a 4′x 8′ shaft, 130′ deep, with 145′ of drifts. Idle. J. P. Rathburn, of Williams, owner.

*Sulphur Creek Mining District.*—See our XIth Report, pp. 181 to 187. It is near the western boundary of the county, about 20 miles S.W. of Williams, the nearest railroad station. Numerous quicksilver mines have been developed, and a part of them have produced considerable metal. They are mostly idle, but more or less preparation is being made to resume work. Gold is also produced; sulphur mines formerly existed, but are practically abandoned. Numerous mineral springs are among the things of economic interest.

*Wide Awake Consolidated (Buckeye) Mine.*—See our XIth Report, p. 187. It is immediately S.W. of the village of Sulphur Creek, and consists of 64 acres of mining claims, including the *Buckeye*, and 2,000 acres of agricultural and timber lands. A large quantity of good ore is said to have been taken from this mine years ago through a double-compartment shaft about 200′ deep. The workings are inaccessible. Two men are employed repairing the shaft, with a view of resuming work. A. A. Gibson, of Sulphur Creek, owner.

## Lake County.

*bott Mine.*—See our XIth and XIIth Reports, pp. 239 and 360. It ar the head of Grizzly Creek, ½ mile from the eastern boundary of ounty and 28 miles S.W. of Williams, at about 2,500′ elevation. abar occurs in seams in the shale near the contact with serpentine, belt which courses N. of W. The main tunnel, ¼ mile S. of the ace, is 500′ long and courses N., cross-cutting the shales to the ore- It then turns E. and extends 700′ along the ore-belt, as a gang- The ore-shoot, which is 2′ to 18′ thick, is followed 600′ upward, on pe of 30° to 40°, to the upper tunnel. As the work progresses the nd is secured by filling the stopes with waste, by which the expense mbering is reduced. The mine is comparatively dry, well venti- and, where necessary, well timbered. A large quantity of ore is ght, and the output of the mine is said to have averaged 151 flasks month for the last twelve months. The plant consists of a Knox & rne 10-ton coarse-ore furnace; 6 small iron water-jacketed condensers; ower, run by a 20′ overshot wheel, requiring 1½ inches of water, h comes from the mine; commodious ore-sheds; etc. The fine ore ade into "adobies," and treated as coarse ore. Fourteen men are loyed in the mine and works. J. Rathbone, of San Francisco, er; A. A. Gibson, of Sulphur Creek, superintendent.

*merican Mine.*—See our XIIth Report, p. 360. It lies 7 miles W. of illetown and N. of the Great Western Mine, on the cinnabar belt, at 0′ elevation. The furnace was destroyed by fire, and the mine is Wright Bros., of Middletown, owners.

*aker Mine.*—See our XIIth Report, p. 360. It lies 5 miles E. of er Lake. Idle several years. J. C. Baker, of Lower Lake, owner.

*ullion Mine.*—See our XIIth Report, p. 360. It is 4 miles S.W. of dletown, on the cinnabar belt, between the Mirabel and Great tern mines. In 1895 it was being prospected on the surface. Wm. ons et al., of Middletown, owners.

*hicago Mine.*—It lies on the cinnabar belt, 6 miles W. of Middle- n, at 2,500′ elevation. It comprises four 1,200′ by 3,000′ claims. re are two tunnels on the vein, 100′ and 400′ long, respectively, and aft 20′ deep. The vein matter is hard, opaline serpentine, 22′ thick, ving specks of cinnabar throughout. The walls are green and black entine. In November, 1895, there were 5,000 tons of sorted ore on dump awaiting treatment. Munz & Ransdell, of Middletown, ers.

*estinell Mine.*—It is an east extension of the Abbott Mine, and com- es three claims, extending into Colusa County. Idle. J. Rathbone, an Francisco, owner.

*reat Western Mine.*—See our XIIth Report, p. 361. This property lies iles S.W. of Middletown, at 1,860′ altitude. It embraces a 6,000′ strip g the cinnabar belt, which runs through Napa, Lake, and Sonoma ties, in a northwesterly course. The hanging-wall is black alta of un- wn thickness, and the foot-wall greenish-gray, highly metamorphosed lstone, with thin seams of calc-spar and antigorite. The vein mat- s made of an innumerable number of thin layers of black, greenish, ellowish translucent opaline rock, the layers of which are separated till thinner seams of clay and sometimes calc-spar. The thickness e ore-bearing zone varies from 10′ to 150′ and more. The cinnabar

is found associated with pyrite in irregular masses throughout the
The mine is worked to the 500′ level through a double-compart
main shaft, which had, in December, 1895, been sunk to the 700′
Connections with the ore-body were not, however, completed, and
ore from below the 500′ level was raised through a winze by two u
ground hoists, driven by compressed air, and thence up the main s
New levels from the shaft on the 600′ and 700′ levels are now about
long, and are being pushed ahead rapidly to connect with the st
Two Burleigh drills, driven by air, are in use, one in each level. A
nel nearly a mile long connects the works on the 500′ level, and is
for drainage and ventilation; the water from below is raised to
buckets. They are stoping on an ore-body between the 250′ and
levels, which was considered too poor, but found to be rich when
trated. It is about 40′ thick, 80′ long, and 150′ high. Between the
and 700′ levels large bodies of rich ore are blocked out, and stoping
begun. The timbering is a matter of great expense and care.
ground is very heavy, and square sets of 12″ to 36″ round timber
used. They cost 8 cents per running foot. Lagging, made of spli
costs $60 per 1,000 pieces. The mine is very hot, and in some o
stopes it is unbearably so. The cars used are the ordinary end-dum
and hold about 1,500 lbs. The hoists at the main shaft have two dr
4½′ diameter, with two independent engines, 10″x 12″ cylinders.
rope is ⅞″ diameter. There are two air-compressors, a small one
H.P. at the main shaft, and a large one of 25 H.P. at the mouth o
long drain tunnel. There are two furnaces and condensers; on
coarse and one for fine ore, with capacities of 25 and 15 tons each.
product for 1895 was 5,400 flasks. Employed in and about the min
150 men. Great Western Quicksilver Mining Co., owner; An
Rocca, of Calistoga, superintendent.

*Maypole Mine.*—It lies on the cinnabar belt, at 2,500′ altitu
miles W. of Middletown, and is 600′ wide by 1,500′ long. The vei
8′ thick as far as prospected, and carries cinnabar in silicified serpen
There is a 180′ tunnel on the vein, and two cross-cuts, each 50′ l
Farmer & Turner, of Middletown, owners.

*Mirabel* (*Standard*) *Mine.*—See our XIth and XIIth Reports, pp
and 361. It lies 4 miles S.W. of Middletown, on the cinnabar bel
1,600′ elevation, and comprises 1,200 acres. Both walls are light g
serpentine. The vein matter is a hard, dark green or black opa
serpentine, carrying cinnabar in seams and incrustations. The 5′
main shaft, through which all the ore is hoisted, is 425′ deep. It
two compartments, one of which is used for the cage and the other fo
80-gal. water-tank with an automatic discharge. Levels are drive
200′, 250′, 300′, and 400′ deep. An old shaft, 150′ farther west, is
for hoisting waste. A new three-compartment shaft, called the S
Maria, and about 500′ S.W. from the main shaft, has been started.
is 4½′x 12″ in the clear and was 65′ deep, in December, 1895,
timbered with 12″x 12″ sawed timber. Work was suspended for the
ent. Below the 400′ level an incline 105′ deep has been sunk, and a
bottom a drift has been run to meet the Santa Maria shaft when c
pleted. A small hoist and pump, driven by compressed air, stan
the head of the incline on the 400′ level. Stoping is going on betw
the 300′ and 400′ levels and below. The ore-bodies are 20′ to 60′ w
and great care is taken to timber the large chambers securely. Sq

Great Western Quicksilver Mine.

Furnace of the Mirabel Quicksilver Mine.

s of round timber, 18″ to 36″ in diameter, are used. In stoping, t ht 2″ flooring is laid and the ore sorted where it is broken. Iron cars o about 1,500 lbs. capacity are used. The double-engine hoist has & 14″ cylinders, and 3′ drums. The rope is ¾″ steel wire. The ore mped from the cars runs over a grizzly, made of old mine rails, and r a screen with 1″ mesh. The coarse material is ground to the r uired size in a rotary crusher. There are two large new furnaces of t latest pattern for coarse and fine ore. Only fine ore is treated. Oak od costs $3 50 per cord; fir timber, 8 cents per lineal foot, and lagging, $ per 1,000 pieces. The product for 1895 was 4,000 flasks. Standard icksilver Mining Co., owner; W. M. Randol, No. 320 Sansome Street, n Francisco, superintendent.

*Sulphur Banks Mine.*—See our XIIth Report, p. 361. This lies on ear Lake, 10 miles N. of Lower Lake, at 1,340′ altitude. The ore is nd in a hard, white rock. The shaft has two compartments—one for ter and the other for the cage. A double-hoisting engine and a blower nd above the shaft. The mine is very hot, and air is carried down in oden pipes, as iron corrodes very fast in the hot, sulphurous water in e workings. Sulphur Banks Quicksilver Mining Co., No. 306 California reet, San Francisco, owner; R. White, of Lower Lake, superintendent.

*Uncle Sam Mine.*—See our XIIth Report, p. 362. It is 10 miles N.W. Lower Lake. Idle. A. A. Gibson, of Lower Lake, owner.

*Utopia Mine.*—It lies on the bank of Clear Lake, 8 miles E. of Lakeort, at 1,450′ altitude. There are two cross-cut tunnels; one is 120′ ng, with a 30′ drift on the vein, and the other is 150′ long, with a 50′ ift. At the end of the drift a 60′ inclined winze shows good ore all e way down. The vein matter is about 25′ thick, and consists of a eenish-gray sandstone, with seams of serpentine. On the hanging-all lies "alta" many feet in thickness. The foot-wall is serpentine. he strike is S.E. and the dip 60° E. A small amount of water seeps from the lake near the surface. Below 40′ the mine is dry. Utopia ining Co., owner; Thomas Sheridan, of Lakeport, secretary.

*Wall Street* (*Jewess*) *Mine.*—See our XIIth Report, p. 362. It is 6 iles W. of Middletown. Idle.

## Napa County.

*Ætna Mine.*—Described fully in our XIth and XIIth Reports, pp. 72 d 362. It is at the head of Pope Valley, 11 miles S. of Middletown, Lake unty, at 1,340′ altitude. The main tunnel (No. 9 level) is now 4,000′ , and an upraise of 280′ was nearly completed to No. 7 level in 1895. ey are stoping both in the seventh and ninth levels. The ore-shoot very irregular, and averages 200′ in length and 20′ in width. The o furnaces—a 15-ton one for coarse ore and a 20-ton one for fine ore—e constantly running. The product for 1895 was about 3,600 flasks. tna Consolidated Quicksilver Mining Co., owner; W. B. Buckminster, o. 70 Kilby Street, Boston, secretary; B. M. Newcomb, of Oat Hill, perintendent.

*At Calistoga* quicksilver is found in the soil in and about town. See alistoga Mineral Springs.

*Corona Mine.*—It lies at the head of Pope Valley, 8 miles S. of Mideltown, at 1,460′ altitude, and is a recent location on the serpentine lt near Oat Hill. There are three cross-cut tunnels tapping the vein;

the upper one is 90′ long; the next, 60′ lower, is 287′ long, and the one, 194′ still lower, is 400′ long. All of them show a very hard, cious rock, rich in cinnabar. The vein formation is 90′ between w and consists of alternate thin strata of sandstone and "alta." course is E. and W., and the dip 55° S. The country rock south of vein is serpentine, and north is a soft gray sandstone. The compan building a 20-ton fine-ore furnace, to cost about $10,000. Some tons of rich ore lie on the dumps. Vallejo Quicksilver Mining owner; H. C. Davey, of Calistoga, superintendent.

*Harrison Mine.*—See our XIIth Report, p. 363. It is 16 miles S.E. Lower Lake, near the Manhattan. The mine has been idle about a y but it is said it will be opened up shortly. M. Harrison, of Knoxv owner.

*Manhattan (Lake) Mine.*—See our XIth and XIIth Reports, pp. 70 and 363. It lies 17 miles S.E. of Lower Lake, at 1,450′ altitude. older workings in this mine, including those described in our last Rep were closed, when a new discovery was made in the spring of 1895 the hill north of the store. Cinnabar here occurs in seams, 6″ to 6′ w coursing in every direction. The gangue in places is made up of al nate layers of silicious and carbonaceous sinter—chalcedony and ara nite. In other places it consists of a mass of crushed and much decompo diorite. The latter is colored intensely green by an admixture of chro Basaltic bowlders cover the surface of the hill. The ore is mined trenches and open cuts along the veins on the surface. A tunnel been started to cut these veins 150′ below the surface. A small body ore, lately discovered, is now being stoped 100′ from the mouth of old Harkins tunnel, on the east side of the property. It is about 4′ wi and consists of a crumbly material rich in cinnabar. The country r is diorite and basalt. The serpentine belt, which carries cinnabar, a passes through the Redington Mine, just over the hill, runs to the sou of the workings in the Manhattan ground, and is barren as far as pr pected. During 1895 the two 20-ton furnaces produced 85 flasks month. Manhattan Quicksilver Mining Co., owner; R. F. Knox, 237 First Street, San Francisco, secretary; Charles Howard, of Kn ville, superintendent.

*Napa Consolidated Quicksilver Mining Co.'s (Oat Hill) Mine.*—See XIth and XIIth Reports, pp. 65–72 and 364. It lies on James Cre at the head of Pope Valley, 9 miles S. of Middletown, Lake County, 1,810′ altitude. The country rock is a soft gray sandstone, interstrati with innumerable seams of soft "alta." In the three lowest cross- tunnels on the western end of the mine the three following veins, zones, impregnated with cinnabar, are developed: The *Humboldt*, r ning west; the *Osceola*, a branch of the Humboldt, running southw and the *Escape*, running west. All the ore extracted at present (189 comes from the stopes of the Humboldt and Osceola, the faces of wh tunnels are about 500′ from the mouths. An old tunnel (No. 2 Eurek 1,200′ long, is being cleaned out and retimbered to reach a large ore-bo known to exist in the Escape vein. Generally the ore occurs in t sandstone, but sometimes it is found in the "alta" also. The ore-bod are very irregular, and a great deal of dead work is necessary. There nothing to indicate their presence until they are struck. The ground heavy, on account of the many "alta" seams and talc slips. Squa sets of sawed timber are used throughout the mine, and slabs for laggi

Redington Quicksilver Mine.

Manhattan Quicksilver Mine.

men attend to the timbering. The ore is dumped into a bin at the th of the tunnels, and from there hauled by mules in 2-ton cars to h urnaces, half a mile away. The fine-ore furnace has a capacity of 0 ns per day. Another fine-ore furnace of the same size is under o truction. Wood for firing is cut in the vicinity, at $3 75 per cord. ber costs about 5 cents per lineal foot; lumber $12 per M. Driving gangways is generally let to the miner, at from $2 to $2 50 per foot. product for 1895 was 5,700 flasks. Napa Consolidated Quicksilver ing Co., owner; W. B. Buckminster, No. 70 Kilby Street, Boston, tary; B. M. Newcomb, of Oat Hill, superintendent.

*kville Mine.*—See our XIIth Report, p. 364. It lies 1½ miles S. of nerford. Idle. Bella Union Mining Co., owner.

*dington (Knoxville) Mine.*—See our XIth and XIIth Reports, pp. 2 and 363. It is situated 18 miles N.E. of Lower Lake, at 925′ ltude. The mine has been idle since June, 1894, but late in 1895 it va started up again. The 4½′x 10′ double-compartment shaft (now deep) will be sunk 100′ deeper. They were stoping on a fine body e on the 200′ level in 1895. The hanging-wall shows "alta" and al while the foot-wall is decomposed serpentine. The country rock is entine. The ore is black chalcedony with pyrite, and the distance een walls is 15′. Hoisting is done by bucket. The hoist is oper- by a single engine, with a 7″x 14″ cylinder. A flat, woven-wire le, 4″ wide, is used, and winds upon itself. The ore is very hard, n is crushed in Blake crushers, ready for the 30-ton fine-ore furnace. A. McMillan, of Knoxville, owner.

*mmit Mine.*—See our XIIth Report, p. 365. It lies 3 miles S.W. of nerford. Idle. Bella Union Mining Co., owner.

*llejo.*—In the hills N.E. of Vallejo cinnabar is found in many places. Ye s ago several mines were working in that vicinity, but nothing is do there now.

## San Benito County.

*psy (San Benito) Mine.*—See our Xth, XIth, and XIIth Reports, p 15, 371, and 365. It is in the McLeod District, 16 miles N.E. of Hollister, at about 2,700′ altitude. The "Harris" tunnel has been ended to 900′ total length. There is a 10-ton furnace on the property. Idle since February, 1895. San Benito Mining Co., of Chicago, owner; Frank Wixam, of Chicago, superintendent.

*w Idria Mine.*—See our VIIIth and XIth Reports, pp. 483 and 373. It at the head of San Carlos Creek, in a mountainous region, 58 miles S.E. of Tres Pinos. It is developed to a depth of 1,200′ by tunnels, col- ectively 3,000′ in extent. There is a vast quantity of ore (tierras) on the dump and in the old workings, said to run 1% to 15% cinnabar. Also a considerable quantity of unbroken ore in the stopes, rich enough to pay. There is a 10-ton coarse-ore furnace, with a capacity of 110 flasks per month. A new 30-ton furnace will be completed by Septem- ber 1896. Little fine ore (tierras) has been reduced, but the company expect to work the vast quantity now on the dump and in the stopes. The country rocks, in the immediate vicinity of the vein, are shales and sandstones, somewhat metamorphosed, and dipping at steep angles. The hanging-wall, which is better defined than the foot-wall, consists princi- pally of finely laminated clay shales, in which slickensides occur. The foot-wall is poorly defined, and consists of arenaceous shale to soft sand-

stone. Fifty men are employed; 21 in mining, 4 at the furnaces, and 25 roustabouts. New Idria Quicksilver Mining Co., owner; B. M. Newcomb, of Oat Hill, superintendent.

## San Luis Obispo County.

A number of claims were taken up years ago in the Santa Lucia Mountains, in the northwestern part of the county, some development work done, and quicksilver produced, but they are generally idle. See our Xth and XIIth Reports, pp. 580 and 366.

*Black Hawk Quicksilver Mine.*—See our XIIth Report, p. 366. It is in Carpojoro Cañon, 3 miles from the ocean, and 12 miles N.W. of San Simeon. One man is driving a prospect tunnel, said to be 150' long. No furnace or retort at the mine. John Secombe, of San Simeon, owner.

*Josephine Mine.*—See our Xth Report, p. 580. Idle.

*Keystone Mine.*—See our Xth Report, p. 581. Idle.

*Oceanic Mine.*—See our Xth and XIIth Reports, pp. 580 and 366. Idle.

*Ocean View Mine.*—See our Xth Report, p. 581. Idle.

*Pine Peak Mine.*—See our Xth and XIIth Reports, pp. 581 and 366. Idle.

*Rinconada Mine.*—See our Xth and XIIth Reports, pp. 581 and 366. Idle.

*Santa Cruz* (*Sunderland*) *Mine.*—See our Xth and XIIth Reports, pp. 580 and 366. Idle. It is 1 mile W. of Adelaide. Worked intermittently. Produced 20 flasks in 1895. Edwin Smith, of Paso Robles, owner.

## Santa Clara County.

*Bradford & Treadwell Mine.*—See our XIIth Report, p. 367. It is on Silver Creek, 11 miles E. of San José, at about 900' elevation. Idle. C. P. Bradford and J. Treadwell, of Evergreen, owners.

*Guadaloupe Mine.*—See our VIIIth Report, p. 542. It is on Guadaloupe Creek, 6 miles E. of Los Gatos, at 425' elevation. It is said to have formerly produced 1,200 to 1,500 flasks per month. Idle. J. V. Coleman, of San Francisco, manager.

*Hillsdale Mine.*—It is ½ mile W. of Hillsdale. Quicksilver was produced here some years ago. Idle. G. Promis, of San José, owner.

*New Almaden Mines.*—See our VIIIth, Xth, and XIIth Reports, pp. 541, 604, and 370. They are 15 miles S. of San José, at 1,700' elevation. The reduction works are at Hacienda, 425' elevation. These famous mines have produced, since 1850, more than 950,000 flasks or 72,675,000 lbs. During the last eight months of 1895 the output averaged 555 flasks per month. The quantity produced has only been exceeded by those of the Almaden, in Spain. The occurrence of the ore in these mines is characterized by great irregularity in quantity and richness, which has caused a correspondingly great variation in the output, which ranges from 4,000 to more than 47,000 flasks per annum. It occurs in shoots and bunches in a brecciated zone, along the contact of serpentine (foot-wall) and shales (hanging-wall), in which the vein matter is principally serpentine. In portions of the vein, it is full of cinnabar, while in other portions it is very lean, the cinnabar being only in seams. It is generally richer near the hanging-wall, and becomes poorer

depth as the vein matter becomes harder. The company own 8,500 of land on which are the mines, reduction works, and villages of enda, New Almaden, and Spanishtown. The mines are developed depth of 2,500′ below the summit, and the underground workings aid to be more than 70 miles in extent; a large part of which is more or less inaccessible. There are six shafts now equipped with ing works, and more than that number from which the machinery been removed. Those provided with hoisting works are the *Buena t*, *Harry*, *Randol*, *R. R. B.*, *Santa Isabel*, and *Victoria*. There are numerous tunnels of great extent. Ore is now raised only from Harry and Randol shafts. Since our last Report the Harry shaft been sunk from the 700′ to the 800′ level, and about 350′ of drifts on the 800′ level. The vein matter is harder than in the upper s, and contains less metal. Burleigh drills are used in drifting. t 600′ of drifts have been run on the 700′ level and a small quantity e obtained. On the 600′ level an ore-shoot, 45′ wide and 16′ thick, been followed about 650′. The ore varies in quality, but shows fair n the face of the stope. Overlying this shoot, and separated from a thin sheet of "alta," is a body of ore of unknown extent, which recently discovered. The ore is hoisted through the Harry shaft to 00′ level, thence drawn through the Harry tunnel to the surface. s also mined from a shoot in the 1,300′ level of the Randol shaft, h is of comparatively low-grade. The company is sinking the . B. shaft on the eastern side of Guadaloupe Cañon, near the old Enri- Mine, about 1½ miles N.W. of New Almaden and at about 1,000′ tion. It is a 4½′x7½′ double-compartment shaft, and when a depth 0′ is reached a cross-cut will be run to the old Eldridge tunnel, which much rich ore is said to have been mined. If the quantity e is found to be sufficiently great, reduction works will be put up uadaloupe Creek. The timbers used in the New Almaden mines are 0′ 10″ to 20″x20″ redwood, which is obtained at Boulder Creek. Coal ed for fuel in the hoisting works, and wood in the reduction works. latter are on Alamitos Creek, at Hacienda, and consist of eight aces, five of which are now operating. They are constructed to treat of the three sizes into which the ore is reduced: tierras, granza, and zita. It is conveyed from the mine to the works in cars, which make escent by gravity inclines, 250′ and 450′ long, with a piece of level between. The Quicksilver Mining Co., of New York, owner; R. R. ore, of Hacienda, agent; Charles Derby, of Hacienda, superin- ent.

*rth Almaden.*—See our XIIth Report, p. 367. It is 9 miles S.E. of José. Idle. Edward Piercy, of San José, owner.

*Quicksilver Production.*—See table in XIIth Report, pp. 68 and 69. our Bulletins Nos. 7 and 8.

*mmit Mine.*—Described under Stanislaus County.

*right Mine.*—See our XIIth Report, p. 370. It is on a tributary of Alamitos Creek, 20 miles S. of San José, at about 800′ elevation. uksilver was mined here years ago. Idle. Mrs. A. E. Wright, r.

## Siskiyou County.

*Barton & Lange's Mine.*—It lies on Klamath River, 4 miles b
Oak Bar, at 1,855′ elevation. The cinnabar is found in a bed of g
green sandstone, lying between black slate, which dips 45° S. Th
is bought by Chinese for medicinal purposes principally. The tr
lucent red crystals bring $2, and the gray $10 to $12 per pound.
cinnabar sold is obtained by washing the debris in sluices with
riffles. Two tunnels, 65′ and 80′ long, are driven on the vein. J
Barton et al., of Oak Bar, owners.

*On Horse Creek*, 10 miles N.W. of Oak Bar, some cinnabar is foun
the sluice-boxes of the placer mines.

*Siskiyou Quicksilver Mining Co.'s Mine.*—See our XIIth Repor
370. After lying idle for several years, a prospect tunnel is b
driven into the deposit. J. C. McCauly, of Oak Bar, superintende

## Sonoma County.

*Black Bear Mines.*—See our XIIth Report, p. 371. These lie on L
Sulphur Creek, 2 miles S. of the Geysers, at an altitude of 2,500′,
comprise the following locations: *Black Bear*, *Commonwealth*, *Geyser
1 and No. 2*, *Hecla*, *Oakland*, and others, along a wide belt of serpen
which courses N.W. and S.E. and carries cinnabar and metallic qu
silver. Considerable ore has been taken out of these mines years
The tunnels are all caved and the reduction works and buildings bur
Black Bear Consolidated Mining Co., owner; L. W. Fee, of Calist
superintendent.

*Cinnabar King Mine.*—See our XIIth Report, p. 371. This prop
lies on Pine Mountain, 12 miles E. of the Geysers, at 2,840′ elevat
It embraces the following six claims: *Ellen*, *Flying Dutchman*, *G
enough*, *Head Center*, *Last Chance*, and *Paymaster*. A new tunnel,
below the old one, is run 400′ to an ore-body lately (1895) discove
and the old one is being extended 150′ to 200′ to strike the same ore
winze, just finished, connects them for air. The property lies on
Great Western cinnabar belt. The hanging-wall is soft gray sands
and the foot-wall is green and gray serpentine. The vein matter is sa
stone, with thin seams of "alta" and yellow clay. The dip is 45
80° S.W. There are about 2,000 tons of selected ore on the dump, bes
a large quantity of base ore. It is intended to build a furnace earl
1896. Cinnabar King Quicksilver Mining Co., owner; Edward Wi
of Healdsburg, superintendent.

*Great Eastern Mine.*—See our VIIIth and XIIth Reports, pp. 633
371. It lies 4 miles N. of Guerneville, at 400′ altitude. The prop
consists of the *Great Eastern* and *Mount Jackson* claims. The mines
located on a belt of serpentine, coursing E. and W., which can be tra
nearly to the coast. The hanging-wall is serpentine, the foot-wall sa
stone. The vein matter is a hard, silicified serpentine, 20′ to 80′ th
separated from the serpentine of the wall by 6′ to 8′ of "alta." The
is 60° to 90° N. Generally the wall stands well; single stulls, 12′ to
long, are sufficient. Where square sets are required, 6″x 6″ and 8″
sawed timber are used. Work is carried on through the Great Eas
shaft, 360′ deep, from which levels are run at 140′, 220′, and 360′ de

Great Eastern Mine.

Ore-Drier of Great Eastern Mine.

nt the Mount Jackson property. They are now stoping between the 2( and 360′ levels. The hoisting plant consists of an 18″ drum, driven y double engine with 8″x 14″ cylinders. The steel rope is 1″ in diam- te A 25 H.P. Phœnix air-compressor furnishes power for three h nix drills. The coarse ore is piled in sheds to dry and the fine is p d on an inclined drier, composed of planks, over which, and about ″ ove, is placed, in a serpentine manner, 4″ pipe heated by exhaust e n. When the ore is sufficiently dry, the movable foot-board is a n out and the ore falls upon the floor. There is a fine and a coarse r urnace, each of 15 tons capacity. About 2,000 cords of wood is s annually, at a cost of $2 25 per cord. Round timber for the mine o 5 cents per lineal foot. Great Eastern Quicksilver Mining Co., w r; Alfred Abby, 44 Nevada Block, San Francisco, secretary and p rintendent.

*issouri Mine.*—It is 3 miles S. of the Geysers, at 2,760′ elevation, n adjoins the Black Bear property on the east. Only assessment wo is done. L. W. Pittman, of Geysers, owner.

*ttlesnake Mine.*—It lies 4 miles S. of the Geysers, and E. of the Mi ouri, at 2,420′ elevation. Ore from this mine contains a large per- e age of native quicksilver, which leaks out of the ore. Idle. Parrott Es te, owner.

*d Cloud Mine.*—It lies 5 miles S.E. of the Geysers, and W. of the Re lesnake. Several short tunnels were made on this claim, and cin- n ar was found in all of them. Idle. R. Swift, of Healdsburg, owner.

*noma Mine.*—This is 5 miles S.E. of the Geysers, and adjoins the Re Cloud. The mine has furnished a great quantity of quicksilver in or er years. The extensive workings are caved and the mine idle. Mr General Dodge, of San Francisco, owner.

## Stanislaus County.

*mmit Mine.*—It is on the divide at the south end of Red Mountain n western boundary of the county, at 2,750′ elevation. Cinnabar is n ams in very much crushed serpentine, sandstone, and shales. The le lopments consist of a 96′ incline shaft and three tunnels, 130′, 335′, n 350′ long. The 5-ton furnace was in operation a few weeks in 1895, n produced 20 flasks. Three men are employed. Martin Bros. & Co., f ublin, Alameda County, owners; John George and Robert Scott, of a José, Santa Clara County, lessees.

## Trinity County.

*ltoona Quicksilver Mine.*—See our Xth and XIIth Reports, pp. 716 n 371. The property consists of three claims in T. 38 N., R. 6 W., 16 mi s W. of Castella, Shasta County, and 22 miles N.E. of Trinity Cen- er The ore-body, as traced on the surface, trends N. and S. in a p hyritic matrix adjoining a serpentine rock, with streaks and vein- et of cinnabar in conjunction with calcite and quartz; six or eight u seams, all pitching W., are known in a belt about ¼ mile wide. Th "alta" is found on the hanging-wall; the greater proportion of the or earing material is soft, decomposed, and clayey. A complete plant a been erected since our last Report, consisting of a Knox furnace, 32′

6″ high, 30′ wide, and 68′ long, capable of handling 30 tons in twe four hours. There are twelve iron double condensers of the Kno Osborne pattern, and three wooden ones; a drier 10′ square, cap of handling 16 tons a day, is built of brick, with sloping iron grati below each other, permitting the ore to descend from one to the oth The heat from the fire place passes through perforated brick-w in the walls, before escaping, requiring only ½ cord of wood per d The furnace consumes 3 cords; 600 cords of wood are in store. A H.P. engine furnishes the power, with a consumption of 3 cords wood per day, for the hoist and a 10″ pump, making 4 strokes per min in summer, but nearly double that in winter. The shaft, 10′ x 12′ and deep, has a gallows frame 89′ high, with three stations above the co of the shaft; one leading to the drier, one to the furnace, and the t most one to the dumps. On account of the high altitude and clim conditions, the entire plant, as well as the drying floors, tracks, timb and wood, are closely housed, permitting work to proceed during win From the condensers an 80′ flue extends up the mountains, terminat in a 30′ stack. The ore is said to carry 4% of metal. Seventy-five n are employed; 50 in the mine, 7 at the furnace, and the remainder the drying floors and in the workshops. The number of men va with the seasons. An incorporated company, of No. 206 Sansome Str San Francisco, owner; J. P. Stidger, of Cinnabar, superintendent.

*Integral Mine.*—See our XIIth Report, p. 372. This property adjo the Altoona Mine, 22 miles N.E. from Trinity Center. Idle. An inc porated company, owner.

*Cinnabar* occurs near New River City. No developments.

## Yolo County.

*Reed Mine.*—See our Xth Report, p. 793. It is on Davis Creek, n the western boundary of the county. It was extensively worked a nu ber of years ago, and preparations are being made to resume worki Merchants Exchange Bank, of San Francisco, owner.

# SILVER.

## Inyo County.

e under head of Argentiferous Galena.

## Kern County.

*malie Mine.*—See our XIIth Report, p. 141. It is at Amalie, 14 miles f Caliente, at 2,850′ altitude. The vein occurs in a porphyry belt, it 300′ wide, which strikes N. 66° W., and dips 80° N. between a ite foot-wall and a hanging-wall of much decayed eruptive rock. vein averages 24″ in width, and consists of quartz with ruby silver, ethedrite, and silver glance. The incline shaft is 330′ deep, and is g widened and retimbered for two 4′x 4′ compartments. A 60 H.P. ot is partly in position. The plant, of about 16 tons daily capacity, sists of a small breaker, a 5′ Huntington mill, and one Woodbury two Frue vanners, driven by a 20 H.P. engine. Some gold is caught he plates; the bulk, however, is in the concentrates. The bullion ains about 80% silver and 20% gold in value. Amalie Mining Co., er; W. E. Rogers, of Amalie, superintendent.

*arling Rosa Mine.*—It is in Amalie, at 2,920′ elevation. A 40′ shaft loses a 14″ vein, dipping 85° N. between porphyry walls. Idle. . Ferris, of Caliente, owner.

*erris Mine.*—It is on Caliente Creek, near Amalie, at 2,800′ altitude. vein is 3′ thick, dips 85° N. between porphyry walls, and consists uartz carrying silver and a little gold. There is an 85′ shaft, with ′ drift at the bottom. J. B. Ferris, of Caliente, owner.

*onoclast Mine.*—See our XIIth Report, p. 145. It is on Badfish k, 10 miles E. of Isabella. The vein is bunchy, varying from a few es to 12′ in width, and is soft, rotten quartz, carrying silver and a gold. It is reduced in a 5-stamp water-power mill and a 10-ton nide plant. Stebbens & Porter, of Isabella, owners.

n the high peak 2 miles S.E. of *Isabella* several strong veins occur h carry an ore containing silver, antimony, and arsenic. Owing e low price of silver nothing is being done with them.

*ccidental Mine.*—See our XIIth Report, p. 146. It is on Caliente k, 14 miles E. of Caliente, at 2,850′ altitude, and adjoins the Amalie. two old shafts have been deepened to 100′, and some drifting has done. A cross-cut tunnel, to be 550′ long, is now 400′ long. The is 1′ to 2′ wide, and dips 80° N. The ore, a chloride near the ace, changes to a sulphide in the deeper workings. James B. Parker, o. 512 E. Twelfth Street, Los Angeles, owner.

## Napa County.

*Mount George.*—Argentiferous galena float is found on the slopes of ... mountain, near Napa, and also in American Cañon, 6 miles N.E. ... Vallejo.

*Mountain View* (*Napa Consolidated*) *Mine.*—It is situated in Ki... Cañon, 2½ miles N. of Calistoga, at 1,200′ altitude. The vein is said ... be 9′ wide and to consist of quartz, with copper pyrite, rich in silver. ... developments are a 515′ cross-cut tunnel and a 10′ drift on the v... Idle several years, and partly caved. Dr. W. D. Smith, of Calist... owner.

*Palisade* (*Grigsby*) *Mine.*—See our VIIIth and XIIth Reports, ... 413–415, and 396. It lies in Kings Cañon, 2½ miles N. of Calistoga ... 710′ altitude. Idle. Grigsby & Johnson, of Calistoga, owners.

*Silverado Mine.*—See our Xth and XIIth Reports, pp. 363 and 376. ... is situated 5 miles N. of Calistoga. Idle many years. Alexander B... lam, of No. 513 Market Street, San Francisco, owner.

## San Bernardino County.

The silver mining industry in this county is almost at a stands... only a portion of the mines owned by the Silver King Co. (Ltd.) be... in operation. There are numerous mines containing silver ores wh... could be profitably worked were silver worth a dollar per ounce or th... abouts, which can only be operated now at a loss. Following i... résumé of the various silver districts and mines:

*Bismarck Mine.*—See Occidental.

*Black Metal Mine.*—See our XIIth Report, p. 376. It is 50 miles ... of The Needles and 3 miles from the Colorado River. It produces cop... and silver ore. Idle. Monaghan & Murphy, of The Needles, own...

*Blue Jacket Mine.*—See our IXth Report, p. 230. It is 3 miles N... of Oro Grande, at 3,300′ elevation. The vein strikes N.E. and S.W. ... dips S.E. There are two shafts, 40′ and 80′ deep, on the vein, whic... 4′ to 8′ wide. The rock is white quartz, with considerable calcite, c... taining blue copper carbonate (azurite). Idle.

*Bonanza King.*—See our Xth Report, p. 532. It is in Trojan Distri... 25 miles N. of Fenner. At one time a large producer, but idle m... years. The mine is 800′ deep. Present owners unknown.

*Calico District.*—See our VIIIth, IXth, Xth, and XIIth Reports, ... 491, 224, 530, 337, and 376. It is 6 miles N. of Daggett and embr... the entire Calico range, including what is known as West Calico ... East Calico, or the Borax District. There are mines containing chlo... silver ores, and in some places lead ores are scattered all along ... southern part of the range for a distance of 8 miles. The mineral ... is about 2 miles wide at the eastern end and narrows going westw... though its full extent has never been actually determined. In all ... large field only two groups of mines are in actual operations, viz.: ... *Oriental* and *Occidental* groups (q. v.). At the time of the last v... of the field assistant to the district it was noted that the violet-br... porphyritic liparite (locally called "birdseye") does not form a nuc... mass in the range, but occurs as a later intrusive and effusive r... breaking through the older tufaceous breccias and tufas, and in ... northern part of the region capping some of the hills, the sheets ly...

he tufas. This is an important feature of the structural geology of h region never before noticed. On the east side of the district the x mines are still working, and new deposits are being developed. ide of the *colemanite* mines little is being done in the borax deposits.

*rbonate Mine.*—It is ½ mile E. of Oro Grande. See under head of ntiferous Galena.

*sert Queen Mine.*—See Imperial Lode.

*rapevine District.*—See our IXth and Xth Reports, pp. 223 and 531. t W. of Calico District and N. of Barstow. It was discovered in 1880. e prospecting has been done in the district within the past two years, some silver-bearing deposits found, but no work of consequence le.

*umbug Mine.*—See our VIIIth Report, p. 497. It is 2 miles N.E. of aco. The ore occurs as impregnations in nearly horizontal beds of n, which have been worked extensively by a system of open cuts and nderground stopes carried to shallow depths.

*nperial Lode.*—See our XIth and XIIth Reports, pp. 351 and 376. It s n Lava Beds District, 36 miles E. of Daggett. The lode is exposed oa distance of 8,000′, cropping boldly above the surface the entire istance. It strikes N.E. and S.W. and dips N.E. The claims are the *Dert Queen, Mammoth Chief, Meteor, Morning Star,* and *Sampson.* ft Mammoth Chief, Meteor, and Morning Star claims are extensively leloped by tunnels, shafts, and open cuts; the other claims lying at an end of the lode have only a small amount of development. Assessnt work only is now being done in the mines.

*anpah District.*—See our Xth and XIIth Reports, pp. 531 and 376. ts 25 miles N.E. of Vanderbilt, near the Nevada State line. The ilr mines of the district are idle.

*psephine Mine.*—See Silver King.

*angtry Mines.*—See our XIth Report, p. 343. They are 5 miles W. of Calico, and comprise a group of claims upon which considerable rk has been done. The veins are fissures in tufa, and are the only es in this district entitled to be called fissures. The strike is E. and W and the dip 80° N. The tufa lies in nearly horizontal beds. The n filling is baryta and quartz containing chloride of silver, iron xle, and carbonate of lead. Idle. T. N. Stebbins, of Daggett, owner.

*ava Beds District.*—See our IXth, Xth, and XIth Reports, pp. 230, 2 and 349. It is about 35 miles E. of Daggett and 10 miles S. of ic. In the district are veins and deposits of silver, copper, and -bearing ores. The copper mine only is at present being worked. e Tiptop Mine under head of Copper.

*Tammoth Chief Mine.*—See Imperial Lode. Fred Clark, of Daggett, ner.

*Teteor Mine.*—See Imperial Lode. George W. Grayson, of San Franco, owner.

*Torongo* (*Nichols*) *Mine.*—See our VIIIth, IXth, and Xth Reports, 503, 228, and 526. It is 50 miles E. of Victor, in the San Bernarno Mountains. The vein is 4′ to 8′ wide. There are four shafts, 20′, 50′, and 100′ deep, respectively. Some drifting has also been done. d. Judge J. Nichols, of Los Angeles, owner.

*ew York District.*—See our XIIth Report, p. 376. It is 3 miles W. f Hanvel. All the silver mines of the district are idle.

*North Camp.*—See our IXth Report, p. 228. It is 7 miles N.W. Oro Grande. All mines in the camp idle.

*Occidental Group.*—See our VIIIth Report, p. 497. These mines 2 miles N.E. of Calico, at about 3,600′ elevation. The most impor mines of the group are the *Argonaut*, *Bismarck*, *Cleveland*, *Garf Invincible*, *Runover*, *Thunderer*, and *Veto*; all of which have been wor extensively. The surface cuts are of large size, and some of the st are of unusual dimensions, and without a stick of timber or artifi support of any kind. One tunnel has been driven over 4,000′, cut through the Cleveland, Garfield, Occidental No. 1, Runover, and V mines. One hundred feet higher is a second tunnel, 2,500′ long. T group of mines has been worked constantly for years, and prod some very rich ore, besides a large amount that is low-grade. The bearing formation is rhyolite tuff, locally called sandstone, and gr liparite breccia, in part tufaceous. The ore deposition has taken pl along certain lines of faulting and crushing, great chambered v having formed on one side or the other of these fault-planes, and o sionally on both sides. In other instances deposits have taken pl between two converging fissures. The ores are hauled 2 miles by wa to the mill near Calico. Silver King Mining Co. (Ltd.), of Lond owner; William S. Edwards, of San Francisco, manager.

*Odessa Group.*—See our XIth Report, p. 343. These mines are ab 1½ miles N.E. of Calico, at 3,200′ elevation. The principal claims the *Dragon Nos. 1 and 2*, *Dunderberg*, *Gobler*, *Little Jane*, and *Ode* All are extensively developed, and have been large producers. T are at present idle. Silver King Mining Co. (Ltd.), of London, own William S. Edwards, of San Francisco, manager.

*Oriental Group.*—See our VIIIth and XIth Reports, pp. 497 and 3 It lies just back of the town of Calico, on the south flank of the K Hill. The principal mines are *Oregon No. 3*, *Oriental Nos. 1*, *2*, *3*, *4*, *5*, *Red Cloud*, and *Wall Street*. The development has been made mos through tunnels entering the mountains from Wall Street Cañon. winze has been sunk 200′ below the lowest adit. The ore-shoots h formed here both as impregnations, as described in the Occiden group, and as veins in liparite breccia, the vein-filling being chi baryta and iron oxide. These mines are in active operation. Th still remains considerable unprospected territory in which ore-sho are expected. It is expected an air-compressor will be added to surface plant and a hoist will be set up underground, which will operated by means of air, and the unknown territory prospect Silver King Mining Co. (Ltd.), of London, owner; William S. Edwar of San Francisco, manager.

*Oro Grande* (*Silver Mountain*) *District.*—See our IXth, Xth, and X Reports, pp. 230, 527, and 360. It lies E. of the Southern Califor R. R., the nearest station being Oro Grande. The mines of the distr produce gold, lead, silver, and copper. No silver mines are at pres in operation, except the Carbonate Mine. See Argentiferous Galena.

*Providence District.*—See our IXth, XIth, and XIIth Reports, 223, 519, and 376. It is N. of the A. & P. R. R., the nearest stat being Fenner. No silver mines are in operation.

*Red Jacket.*—See Silver King.

*Rising Sun Mine.*—See our IXth Report, p. 232. It is in Lava B District, 35 miles E. of Daggett. Idle. — Wallace, of Alhamb owner.

*mpson Mine.*—It is an idle claim on the Imperial Lode in Lava s District. Samuel Blair, of Daggett, owner.

*lver King Group.*—See Waterloo Mining Co.

*lver King Mining Co. (Ltd.).*—It owns the *Occidental*, *Odessa*, *Oriental* groups of mines, and the *Silver Monument Mine* at Calico. y are operated under one management, all the ore being crushed in company's 30-stamp mill (Boss process). Water is obtained by ping from a well sunk in the desert wash south of the mill. Both d and coal are used as fuel. The boiler and engine are 125 H.P., gh less than this amount is actually used. The installment of air- pressors for the purpose of running hoists and fans in the mines is er consideration. The salt used in milling operations is from the beds 30 miles S. of Danby. Silver King Mining Co. (Ltd.), Crocker ding, San Francisco, owner; William S. Edwards, of San Francisco, ager.

*lver Monument Mine.*—See our VIIIth Report, p. 497. It is in Cal- The ore occurs as an impregnation in a great mass of white, ashy, olite tufa. It has produced a large amount of ore since 1887, but is idle. Silver King Mining Co. (Ltd.), of London, owner; William dwards, of San Francisco, manager.

*ilver Mountain District.*—See Oro Grande.

*ilver Reef District.*—See our XIth and XIIth Reports, pp. 365 and It is at the northern base of Black Hawk Mountain, 40 miles E. ictor. There are a large number of claims in the district on which e or less work has been done. Some of the mines produce high- le silver ore, and also some gold rock. Assessment work only is done.

*rojan District.*—See Providence.

*iptop Mine.*—See our XIth and XIIth Reports, pp. 354 and 69. It Lava Beds District, and is a copper-silver mine, which is worked in all way. W. H. Masters et al., of Cleveland, Ohio, owners; W. dman, of Daggett, superintendent.

*Vaterloo Mining Co. (Silver King) Mines.*—See our VIIIth, XIth, and th Reports, pp. 498, 339, and 376. These properties are on the north of Wall Street Cañon, near Calico, at 3,500′ elevation. The prin- l claims are the *Josephine*, *Red Jacket*, and *Silver King*. They were ely worked and very productive in former years, but have of late idle, or worked in a small way by lessees. The company's mills near Daggett, 6 miles N. of the mines, where there are a 15-stamp , called the Oriental, and a 60-stamp mill, known as the Waterloo. mills are connected with the mines by a narrow-gauge railroad. erloo Mining Co., of Milwaukee, owner; W. H. Hardy, of Daggett, t.

*Vaterman Mines.*—See our Xth Report, p. 531. They are in Grape- District, 4 miles N. of Barstow. The *Waterman* is the principal e of the group. All the mines have been idle since 1886. Waldo Vaterman, of San Diego, owner.

*Vest Camp.*—See our XIIth Report, p. 26. It is 12 miles W. of Oro nde. The veins contain silver ore, and some of them lead. All are id.

## San Mateo County.

*Redwood City.*—Some years ago (see our Xth Report, p. 591) a was bored 560′ in depth to obtain a supply of water for municipal poses. *It is unauthoritatively stated* that at a depth of 215′ a strat thickness not given, of galena ore was encountered which assayed lead and $48 per ton in gold and silver. At 330′ an 8′ stratum of rock was reached which assayed $55 per ton in gold and silver. At a 10′ stratum of sedimentary deposit was encountered which contai native silver and assayed from $400 to $1,000 per ton. A specime this is in the Museum of this Bureau. At 540′ the drill entered qua which continued to the bottom and assayed $46 per ton in gold silver. It has been intimated that the rock was "salted," but the w borer, Mr. S. Haley, of San Francisco, said that he was quite certain t the quartz rock was not.

Argentiferous galena is found at other points, viz., at *Searsville*, at *Larce* claim, near Redwood City, and also 4 miles W. of Menlo P It would seem, therefore, that it is not improbable that silver migh found in paying quantities in San Mateo County as a result of int gent and systematic search.

## Shasta County.

*Afterthought Mine.*—See our XIIth Report, p. 377. It is a paten claim at Furnaceville, on North Creek.

*Black Prince Mine* (Quartz)—.It is 2 miles N.W. from Igo, at 1,4 elevation. It is a contact vein, between granite and slate, coursing N and S.W., and dipping 45° E. The walls proper are 100′ apart; the v consisting in part of 37′ of quartz, while in other portions the qua forms into several distinct seams. A shaft has been sunk 110′ a drifted from, 115′ E. and 75′ W. The hoist is a horse-whim, and mine water is bailed by buckets. A 40′ cross-cut has been run. Ass ment work only. One man is at work. S. W. Robinson, of Igo, own

*Bully Hill* (*Copper City*) *Mine.*—See our XIIth Report, p. 377. It 3 miles N. of Copper City, and comprises three claims. Idle.

*Extra Mine.*—See our XIIth Report, p. 377. It is ¼ mile from Cop City. Idle.

*Last Chance Mine.*—See our XIIth Report, p. 377. It is on No Cow Creek, 9 miles N. of Round Mountain.

*Northern Light Mine.*—See our XIIth Report, p. 377. It is 1¼ mi from Copper City. Idle.

*Recorder Mine.*—See our XIIth Report, p. 377. It is 3 miles N. Copper City. Idle.

*South Fork Mining and Milling Co.'s* (*Black Prince*) *Mine.*—See XIIth Report, p. 377; also see Black Prince Mine.

*Winthrop Mine.*—See our XIIth Report, p. 378. It is ½ mile N. Copper City. Idle.

## Tulare County.

*lack Prince Mine.*—See our XIIth Report, p. 296. It is in Redwood
on, 6 miles E. of Badger, at 2,600′ elevation. The vein is filled with
rd garnetiferous rock, carrying silver and copper. It is 5′ wide and
between walls of talcose slate. Development consists of a shaft 50′
and a tunnel 150′ long. E. Walters, of Badger, owner.

*luebird Mine.*—See our XIIth Report, p. 296. It is in Redwood
on, 8 miles E. of Badger, at 2,700′ altitude. The vein is 4′ wide and
ists of a hard silicious matter. The country rock is talcose slate.
e are two tunnels, 65′ and 200′ long, on the vein. Kirkland Bros.,
uckland, owners.

*omingo Mine.*—See our XIIth Report, p. 296. It is in Redwood
on, at 2,550′ altitude, and near the Black Prince. The ore and
ciations are similar. E. Walters, of Badger, owner.

*ray Eagle Mine.*—See our XIIth Report, p. 296. It lies in Redwood
on, 6 miles E. of Badger, at 2,800′ altitude. The development con-
of a 60′ shaft and a 150′ tunnel. The vein is 4½′ thick and is a
l, epidote-garnet rock, with galena and chalcopyrite. The country
is talcose slate. W. Hart, of Badger, owner.

*art Mine.*—This is an extension of the Gray Eagle. Idle. W. Hart,
adger, owner.

*ineral King Mines.*—See our VIIIth Report, p. 645. They lie in the
Sierra, 60 miles E. of Visalia. The ore is refractory galena and
-blende, carrying about 40 ozs. of silver per ton and a little gold.

# STRUCTURAL MATERIALS.

## BASALT.

### Napa County.

*Columnar Basalt* occurs in Clark's Cañon, 12 miles W. of Napa, on the land of Charles Clark, of Napa.

*Columnar Porphyry* is found on the eastern slope of Mount Hel[en]a, 6 miles W. of Kellogg. Columns, 3" to 5" diameter, are found, 4' t[o] long. The rock is hard and brittle and of a gray color, and stained

## CEMENT.

### San Bernardino County.

*California Portland Cement Works.*—See our XIIth Report, p. [3]. These are ¼ mile W. of Colton, at 1,000' elevation. The limestone u[sed] in the manufacture of the cement is quarried from a hill situa[ted] immediately back of the works. The quarry is connected with [the] manufacturing plant by an inclined tramway about 1,000' long, [and] rising 600' to near the summit of the hill. The plant, consistin[g] four Griffin mills, two revolving oil-burning furnaces of the Duree t[ype] and all the other necessary pulverizing and conveying machinery, [etc.] is located at the side of the Southern Pacific R. R. The limest[one] said to be almost pure, is mixed with a certain proportion of clay [and] fluor-spar from the Castle Dome mines in Arizona, pulverized [and] roasted at an intense heat. A semi-clay-like mass, or "clinker," is [the] result. This is cooled, re-ground, and sacked for shipment. A v[ery] complete laboratory and testing-room is connected with the establ[ish]ment. Seventy-five men are employed. The capacity of the work[s] said to be 200 bbls. per day. California Portland Cement Co., of [Los] Angeles, owner; F. N. Spear, of Colton, superintendent.

### Solano County.

*Benicia Works.*—See our XIIth Report, p. 380. Idle. J. G. John[son] and James Clyne, of Benicia, owners.

## CLAY, BRICKS, POTTERY, ETC.

### Alameda County.

*California Pottery and Terra Cotta Co.*—See our XIIth Report, p. [38]. Its works are on Twelfth Street, in East Oakland. There are two kil[ns] 18' and 16' in diameter, fired with wood. Sewer and chimney pi[pe]

er-pots, vases, tiles, fire-bricks, stove linings, etc., are manufactured. clay used is obtained from Carbondale, Amador County. Eleven are employed in the works. S. W. Winsor, of Oakland, manager.

*. Clark & Sons' Pottery.*—See our XIIth Report, p. 381. It is in the of Alameda, and consists of eleven kilns—two 25′ in diameter, eight and one still smaller. A Whitacre machine for making pressed ss is being erected. The company manufacture vast quantities of ified sewer and water pipe, chimney pipe and tops, fire-proofing, etc. clays are principally obtained from Carbondale, Amador County. Clark, President; George A. Clark, of No. 13 Spear Street, San Fran-, secretary.

*kland Art Pottery.*—It is on Twelfth Street, between Twenty-second Twenty-third avenues, Oakland. There are three kilns—one 20′ and 18′ in diameter. All sorts of ornamental vases, flower-pots, chimney s and tops, standard sewer-pipe, ornamental tiling, water-coolers, and eral terra cotta wares are manufactured. The clays used are prin-lly obtained near Carbondale, Amador County. Twenty-nine men employed. James Miller, of No. 1125 E. Twelfth Street, Oakland, rietor.

*milliard Brick Co.'s Works.*—See our XIIth Report, p. 381. They on the S. P. R. R., 1½ miles N.E. of Pleasanton. There are two een-compartment Hoffman kilns of 20,000 daily capacity each. But kiln is now in operation. Only common bricks are made. They made from a superficial deposit of sandy loam, 25′ thick, which is the kilns. Sixty men are employed during summer. P. H. Lam-ux, of Oakland, secretary; E. R. Sinard, of Pleasanton, superin-ent.

## Amador County.

the vicinity of Carbondale are large and numerous deposits of clay perior quality, and also of sand. In these deposits large excava-s have been made at many points, and the material shipped to pot-s and pressed-brick works throughout the State, large quantities g to Alameda, San José, Sacramento, and even as far as Los Angeles. total annual shipment of clay alone from Carbondale is about 16,000 . Sand, up to the present time, has been shipped in limited quanti-to iron foundries, where it is used in molding. This branch of the stry will doubtless grow into greater proportions as the peculiar ss of this sand for the purpose becomes better known.

*arbondale Pottery.*—These works are at May P. O., 1 mile from ondale Station. There is but one furnace, and this is fired inter-iently. Drain-pipe, terra-cotta chimney tops and pipes, fire-bricks, a line of stoneware, jugs, jars, etc., are the principal articles manu-ured here. Fred Hammer, of May P. O., owner.

*. Clark & Sons' Clay-pits.*—These are scattered within a radius of 3 s of Carbondale Station. They are worked constantly, except ng the rainy season. To provide the necessary supply during the r months, several thousand tons are mined and placed under cover ng summer. N. Clark & Sons, of Alameda, owners.

*eath & Smith's Clay-pits.*—They are in the vicinity of Carbondale, supply large quantities of clay, of which there are several qualities, otteries and terra cotta works throughout the State. During the mer months 4,000 tons will be housed for shipment during winter,

when the rains make it impossible to dig or ship the clay from the
Heath & Smith, of May P. O., owners.

## Butte County.

*Walker's, W. A., Brickyards.*—They are 3 miles S.E. of Chico,
supply the local markets at Biggs and Gridley. A superficial depo
sandy loam, 3′ to 6′ thick, lying between the surface soil and under
sand, is used successfully. Where hardpan occurs beneath the loa
is the case in many places, it is said to contain too little sand to
good bricks.

## Contra Costa County.

*Mount Diablo Pottery and Paving Brick Co.'s Works.*—They have
recently established on the railway, ½ mile W. of Antioch. The
pany will manufacture paving and pressed bricks, terra cotta, fire-p
ing, sewer-pipe, flower-pots, roofing-tiles, etc. The clays used are
stratified beds in the foothills, S. and W. of the pottery, and, so f
they have been tested, are said to be satisfactory. E. T. Maple, of
och, superintendent.

## Kern County.

*The Bakersfield Patent Brick Co.* of Bakersfield made about 60
bricks during 1895.

## Los Angeles County.

The manufacture of bricks and terra-cotta ware has been gr
stimulated by the use of oil as fuel, and by the increasing deman
structural material. The Pliocene formations around Los Angeles a
an inexhaustible supply of clay suitable for brick, and for mixing
other clays in the manufacture of terra-cotta ware.

*Berg & Loyne's Brickyard.*—It is at Los Angeles. An open kiln,
by wood, is used, with a capacity of 8,000 bricks a day. Outpu
1895, 1,500,000 bricks. Ten men are employed. Berg & Loyne, of
125 W. Second Street, owners.

*California Sewer-Pipe Co.'s Brickyard.*—It is at Vernon, 1 mile
Los Angeles. There are three down-draught kilns—one of 20′ and t
28′ diameter—in which oil for fuel is used. Sewer-pipe, water-p
flue-lining, fire-bricks, drain-tiles, etc., are manufactured. The cl
obtained from near Elsinore, Riverside County. Twenty-six me
employed. California Sewer-Pipe Co., owner; T. M. Riley, of No
S. Broadway, manager.

*Capitol Steam Brick Works.*—Located at Los Angeles. An open
fired by wood, coal, and oil, is used. Its capacity is 40,000 bricks a
Forty men are employed. E. Simons, of No. 125 W. Second S
owner.

*City Brick Co.*—See our XIIth Report, p. 381. Its yard is lo
in Los Angeles, and employs an open kiln, fired with wood. Its cap
is 38,000 bricks a day. Thirty-five men are employed. A. A. Hub
of No. 125 W. Second Street, manager.

*Davin's Brickyard.*—It is in Los Angeles, and uses an open kiln,
with wood. Its capacity is 12,000 bricks a day. Twelve men

loyed. P. Davin, corner Saratoga and Brooklyn streets, Boyle ghts, owner.

*ureka Brick Co.*—Its open kiln is located in Los Angeles, and heated i oil. Its capacity is 18,000 bricks a day. Fifteen men are employed. R. Gleason, of No. 127 W. Second Street, superintendent.

*orrester's Brickyard.*—It is in Los Angeles, and uses an open kiln, . with wood, coal, and oil. Its capacity is 8,000 bricks a day. Six are employed. C. Forrester, of No. 125 W. Second Street, owner.

*amble's Brickyard.*—It is at Garvanza. An open kiln, fired with d, is used. Its capacity is 8,000 bricks a day. Eight men are loyed. J. M. Gamble, of Garvanza, owner.

*oulahan & Griffith's Yard.*—It is at Inglewood. They employ two ehke continuous kilns, fired with oil and coal. Capacity, 12,000,000 ks a year. Sixty men are employed. Houlahan & Griffith, of No. Stimson Block, owners.

*nsen's Brickyard.*—It is in Los Angeles, and uses open kilns, fired wood. Capacity, 38,000 bricks a day. Thirty men are employed. ensen, of No. 130 W. Second Street, owner.

*oyce's Brickyard.*—Located in Los Angeles. A continuous kiln, fired coal, is used. Capacity, 24,000 bricks a day. Thirty men are loyed. T. F. Joyce, of No. 125 W. Second Street, owner.

*arr Frampton & Co.'s Brickyard.*—It is at Los Angeles. Uses an kiln, fired with oil. Capacity, 16,000 bricks a day. Eighteen men employed. Karr Frampton & Co., of No. 125 W. Second Street, ers.

*s Angeles Pressed Brick and Terra Cotta Co.'s Works.*—They are ted at Los Angeles. Employ five down-draught kilns, fired with an "distillate" of 24° B. Twenty men are employed. Company's ffe, No. 119 S. Broadway; L. F. Miller, superintendent.

*onarch Brick Co.'s Yard.*—It is at Los Angeles. Uses open kilns, . with wood and oil. Capacity, 34,000 bricks a day. Thirty men employed. Whitman & Workman, of No. 127 W. Second Street, ers.

*ay Brickyard.*—It is at Los Angeles, and uses open kilns, fired with d. Capacity, 18,000 bricks a day. Twenty men are employed. C. , corner Mott and Seventh streets, Boyle Heights, owner.

*ierson & Anderson's Brickyard.*—It is at Los Angeles. Uses an kiln, fired with wood and coal. Capacity, 8,000 bricks a day. t men are employed. C. Schroder, of Pico Heights, owner.

*imon's Brickyard.*—It is at Los Angeles. A Hoffman continuous , fired with coal-slack and wood, is used. Capacity, 25,000 bricks a Thirty men are employed. R. Simons, of E. Seventh Street, near le Avenue, owner.

## Marin County.

here are three large brick plants in this county, all within a few s of San Rafael, and accessible to tidewater. They were fully ribed in our XIIth Report, p. 382, and are as follows: The *Fortin k Co.*, the *Patent Brick Co.*, and the *Remillard Brick Co.*

## Mono County.

*Gorman's Deposit.*—It is 1 mile S.E. of Bodie, and is very exte proven by a 190′ tunnel and various cross-cuts. It is hard and s places, of many colors, and estimated to be 60′ to 80′ thick. Lo used for brick. Hugh Gorman, of Bodie, owner.

## Placer County.

*Gladding, McBean & Co.'s Potteries.*—See our IXth and XIIth Re pp. 297 and 382. They are at Lincoln, at 170′ elevation. All so architectural terra cotta, vitrified sewer-pipe, 3″ to 30″ in dian vases, flower-pots, hollow tile, fire-proofing, pressed and fire brick, are made. The works consist of a 150 H.P. engine and 4 boiler down-draught kilns; the necessary mixing, grinding, and pugging r etc.; and a Boyd's brick-press, for manufacturing pressed brick i semi-dry way, has been recently added and is in successful opera 80 tons pressure is said to be applied on each brick. A large qua of fuel is required. The supply of wood is decreasing, and is replaced by oil under the boilers and coal in the kilns. The (kaolin) used are principally obtained from two large pits at the ea end of a low ridge 1 mile N. of the pottery. The following secti shown in the southern pit:

| | |
|---|---|
| Soil | 1′ |
| Volcanic breccia | 12′ |
| Light, sandy clay | 8′ |
| Fine sand | 4′ |
| Sandy yellow clay | 7′ |
| Sandy clay with gravel | 6′ |
| Clay. | |

The following section is of the northern pit:

| | |
|---|---|
| Soil, etc. | 2′ |
| Volcanic breccia | 10′ |
| Fire-clay (for fire-proofing, etc.) | 10′ |
| Pipe-clay (for sewer-pipe, etc.) | 6′ |
| Fine white terra cotta clay | 20′ |

The clay is excavated in the northern pit to a depth where w interferes. The extent of the deposit is unknown. A hole 60′ deep, in the bottom of the pit, is said not to have reached the bottom o clay, and it is said to underlie the town of Lincoln, where it has penetrated by wells. One hundred and fifty-six men are employed R. Chambers, of San Francisco, secretary; A. J. Gladding, of Lin superintendent.

## Riverside County.

*Elsinore Coal and Clay Co.'s Works.*—They are 6 miles W. of Elsi at 1,200′ elevation. The several pits are near the Elsinore (*Cha* coal mine. About 5,000 tons of clay have been shipped to manufa ing establishments. Should the Southern California R. R. exten tracks to this locality the industry is likely to become one of import D. W. McCrea, of Elsinore, superintendent.

*McKnight Clay Works.*—It is 4 miles S.W. of South Riverside, at 1 elevation. The clay is of the indurated variety, and occurs as a b

Tertiary rocks, having a dip conformable to the sandstone. The -pits near Elsinore and in Temecula Cañon are mostly Quaternary sits. The clay is shipped to the pipe-works at South Riverside and e terra cotta works at Los Angeles. The output at present is 200 per month. J. H. McKnight, of South Riverside, owner.

*cific Clay Manufacturing Co.'s Works.*—They are in Temescal Cañon, iles E. of South Riverside. Several pits are opened in this locality the clay shipped by wagons to South Riverside, where the pipe- s of the company are located. M. Findlay, of South Riverside, rintendent.

## Sacramento County.

*pital Sewer-Pipe Works.*—See our Xth Report, p. 509. They are in astern part of the City of Sacramento. They consist of two down- ght kilns, 18′ to 20′ in diameter, and a Vaughn sewer-pipe press, of to 1,800 pieces daily capacity, depending upon the size of pipe. clay used is obtained near Carbondale. Nine men are employed. ge Muddox, of Sacramento, owner and manager.

*ountain Bros.' Brickyard.*—See our Xth Report, p. 508. It is in the hern part of the City of Sacramento. A superficial deposit of loam, , and sandy clay, 6′ thick, is used for making bricks. It varies in acter from loam at the top, through clay, to sandy clay at the bot- which, by thoroughly mixing, forms good material for bricks. ut 1,000,000 bricks are burned annually in common kilns. Ten are employed when working. W. A. Fountain, of Sacramento, ager.

*reuzberger & Harvie's (Ryan) Brickyard.*—It is near Fountain Bros.' , in the southern part of the City of Sacramento. Dark sandy , 6′ to 10′ thick, is used; 200,000 bricks are burned per month, or ,000 per annum, in common kilns. Twenty-four men are employed. . Harvie, of Sacramento, manager.

*acramento Transportation Co.'s Brickyard.*—See our Xth and XIIth orts, pp. 506 and 383. It is at Riverside, on the Sacramento River, les below the City of Sacramento. The works consist of five brick- nes of 30,000 daily capacity each; two sixteen-compartment Hoff- n kilns of 50,000 daily capacity each; a dredger for excavating, and ilroad for transporting the clay from the pits to the works. A 12′ rficial deposit of loam, clay, and sandy clay is used. It is partially ed by the steam shovel which fills the pits in the lowlands. The and for bricks now being limited, the works are run intermittently. n running full-handed 160 men are employed, principally Chinese. k Dwyer, of Sacramento, secretary; J. O'Neil, of Sacramento, rintendent.

## San Joaquin County.

ie agricultural industries are most important, and, with this fact in , the Stanislaus and San Joaquin Water Co. developed their irriga- canals during the summer of 1895. Manufacturing industries t Stockton, where shipping facilities are good, are also very impor- sources of revenue. The natural economic mineral resources at nt developed consist principally of the well-known natural gas at kton, manganese in the western foothills, and brick-clays near the Joaquin River. A good supply of water may be had from wells,

80′ to 150′ deep, in most parts of the valley lands, and flowing wells obtained throughout the central part of the valley at about 1,000 depth.

Fine, earthy clay occurs in places in the San Joaquin Valley, which if properly selected, is suitable for making bricks. A number of beds suitable for bricks, etc., have been penetrated by wells in Stockton and vicinity, but their depth has prevented their exploitation.

*San Joaquin Brick Co.'s* (*San Joaquin Improvement Co.'s*) *Yard.*—See our VIIIth and XIth Reports, pp. 561 and 394. It is on the San Joaquin River, 5 miles S.W. of Stockton. The material used is a superficial deposit of fine, earthy clay, which contains enough iron to color the bricks bright red. The clay is mined by dredging; the bricks are made in a Potts machine of 40,000 daily capacity, and burned in a four-chamber Hoffman kiln of 18,000 daily capacity; coal is used for fuel. Fifteen to forty men are employed. C. Horton, of Stockton, secretary; F. W. Muller, of Stockton, superintendent.

*Stockton Terra Cotta Co.'s Pottery.*—See our XIth Report, p. 394. It is at Stockton. Terra cotta, sewer-pipe, etc., are manufactured. The clay used is mined at Valley Springs, Calaveras County. Idle. W. Morgan, of Stockton, superintendent.

## San Luis Obispo County.

*Ah Louis' Brickyard.*—It is 1 mile W. of San Luis Obispo, at about 300′ altitude. Superficial loam is used; the bricks are made by hand and burned in common kilns. About 800,000 are made per annum to the local demand. Eight Chinese are employed.

## Santa Clara County.

*Dreischmeyer's, H., Brickyard.*—It is on Coyote Creek, in the suburbs of San José. Common stock and pressed bricks are made from a superficial deposit of sandy clay, and burned in a Hoffman kiln; 1,250,000 bricks were burned in the summer of 1895, and 25 men were employed.

*Peterson's Brickyard.*—It is on the S. P. R. R., in the southern part of San José. Common and pressed bricks are made from a superficial deposit of sandy clay, 25′ thick, on Coyote Creek, 1 mile E. of the yard. Two patent kilns are used. About 300,000 pressed and 3,000,000 common bricks are made annually. Fifty-five men are employed in summer. T. W. Peterson, of San José, manager.

*Remillard Brick Co.'s Yard.*—It is on the east side of Coyote Creek, in the southeastern part of San José. Common stock and pressed bricks are made. The company owns 170 acres, on which is a heavy superficial deposit of clay suitable for making bricks. A Hoffman kiln is used. The clay is hoisted from the pit by steam-power and transported in side dumping cars to the yards. The works were in operation four months in 1895, and 60 men were employed. C. Sunard, of San José, superintendent.

*San José Brick Co.'s Yard.*—This company have two Hoffman kilns on the Narrow-Gauge Railroad, 1 mile W. of San José. A total of about 12,000,000 common and pressed bricks are produced annually. One hundred and fifty men are employed in summer and thirty in winter. J. M. O'Keefe, of San José, superintendent.

## Santa Cruz County.

ere is a great variety of clays in this county that have only been d in a few cases, and but little is known of their general utility. A r percentage of them are indurated, and occur in the form of argilla- s or clay shales. From their light color and general appearance e are locally known as "chalk rock," but are by no means a chalk. r occur in the hills and bluffs about Santa Cruz and elsewhere in oothills facing the coast. Satisfactory experiments have been made an indurated clay occurring in large masses, though undeveloped, on *Hodge ranch*, 1½ miles S. W. of Glenwood, and near the railway. our Xth and XIIth Reports, pp. 625 and 383.

*Cabe Brickyard.*—It is situated on the San Lorenzo River, about 1 N. of Santa Cruz. Three kilns were burned in the summer of 1895, ucing about 422,000 bricks, principally used in the construction of ew court-house in Santa Cruz. The clay is 15′ to 20′ thick, overlies l of sand, and consists of the disintegrated mass of granitic rocks shales transported from above by water. Just sufficient iron is ained to give the bricks a bright red color. R. M. McCabe, owner; . Bowman, of Santa Cruz, superintendent.

*ihn's, F. A., Brickyard.*—See our XIIth Report, p. 383. It is on San nzo Creek, near Felton. Seventy-five thousand bricks were burned 395.

## Shasta County.

*olt & Gregg.*—This firm has brickyards located at *Anderson* and *ling*. At the Anderson yard, situated 2 miles N. of town, a 30,000 day brick-molding machine is to be put up. The past season 000 bricks were burned. Molded and stock bricks are made by the , which employs in the busy season as many as 250 men; 30 are at work at present. Holt & Gregg, of Red Bluff, Tehama nty, owners.

## Solano County.

*cKenzy & Reid's Pottery.*—It is located in the town of Benicia, and stove linings are manufactured. The clay worked is obtained prin- lly from Ione, and a small quantity from Hoyt's farm, 1 mile N. of lyear's Station. The pottery is run intermittently, and 6 men are loyed. J. McKenzy and M. Reid, of Benicia, owners.

*apa.*—Clay of good quality and in large quantities exists, but is not zed at present.

*nion Pressed Brick and Terra Cotta Co.'s Works.*—These extensive cs are at Vallejo. There are four terra cotta and two brick kilns, ample shed room. Idle. J. W. Pew, of No. 310 Pine Street, San ncisco, secretary.

*allejo Hydraulic Pressed Brick Co.'s Works.*—They are 1 mile N. of ejo. They consist of a large Hoffman kiln, hydraulic pressed brick hine, steam-engine, boiler, etc. Pressed brick were made from the shales obtained at the works. Idle. California Bank, of San Fran- , owner.

## Tulare County.

At Visalia are two brickyards, owned by T. B. Craycoft and Ge Ballou, of Visalia. Their combined capacity is about 1,000,000 br per year.

# GRANITE.

## Madera County.

*Day Quarries.*—They are 2 miles S. of Raymond, and were t oughly equipped in 1893, and worked for a time. Are now idle. & Sons, of Raymond, owners.

*McLennan Quarries.*—They are 1½ miles S.E. of Raymond, and h been worked steadily during the past three years, employing from 2 50 men. The quarry improves as it is opened, both in quality of stone and in the size of the blocks which may be obtained. Block granite, 25′x 25′x 10′, are available, if they could be handled. A. Lennan, of Raymond, owner.

*Raymond Granite Quarry.*—It is 1½ miles E. of Raymond, on a s track of the railroad from Berenda to Raymond. This great qua has been actively worked for several years, giving employment t large number of men at the quarries and at the company's yards San Francisco, where most of the finer stone-dressing is done. A an interval of over two years no considerable impression seems to h been made on this immense, dome-shaped, granite hill. Any notice change has been for the better. The great block referred to in XIIth Report has been proven to be thicker as the front portion been removed. It averages about 20′ in thickness now, 40′ and mor exposed width, and over 300′ in length; when this has been remove similar great concentric mass underlies it. The great advantage in granite lies in its remarkably homogeneous texture. A slab 20′ length, or even more, may be riven from a much larger block by "feather and plug" system, none of the holes being over 3″ or 4″ d and the riven surface will be almost a perfect plane. Raymond Gra Co., owner; D. L. Knowles, of Raymond, superintendent.

## Nevada County.

*Pine Grove Quarry.*—It is ½ mile E. of Nevada City, and comprise acres. It consists of the working of large bowlders of a fine-grai hard granite, suitable for curbing, steps, bases to monuments, etc. hand-derrick with 40′ boom is used. The output last year was 1,00 curbing. Two cutters are employed. E. D. Bridges, of Nevada C owner.

## Placer County.

A large area of granite rock ("grano-diorite" of W. Lindgren, of U. S. G. S.) between Auburn and Roseville stretches northward, mor less disconnected, approximately to Bear River. It is extensively qu ried about Rocklin, Loomis, Penryn, and Lincoln, and is used for gene building purposes, and occurs in large masses, separated by that wh

rtially disintegrated. About Rocklin and Lincoln it is uniformly light colored, and shows too little contrast between polished and h surface. As the eastern boundary of the region is approached it mes darker. It is said to resist great crushing force.

*orghese & Silvino's Quarry.*—It is 2 miles N.E. of Lincoln. Street- ing is worked from an outcrop or bowlder. Three men are employed. orghese, of Lincoln, manager.

*ady's Quarry.*—See our XIIth Report, p. 384. It is near Rocklin. — Brady, of Rocklin, owner.

*urlin & Temple Quarry.*—It is a small quarry, 2½ miles N.E. of Lin- . It employs 3 quarrymen, 3 stonecutters, and 2 hand-power icks. William Burlin, of Lincoln, manager.

*urns (Burns & Coffee) Quarry.*—See our XIIth Report, p. 384. It is mall quarry, 3 miles S.E. of Lincoln. Two steam-power derricks are , and 3 quarrymen and 2 stonecutters are employed. M. Burns, of oln, superintendent.

*alderwood's Quarry.*—See our XIIth Report, p. 385. It is a small ry, 1½ miles E. of Lincoln. Idle. — Calderwood, of Lincoln, owner.

*urlaw Bros.' Quarry.*—It is 1¼ miles E. of Loomis, in Sec. 10, T. 11 . R. 7 E., at about 375′ elevation. There are 17 acres in the property, hich is a vast quantity of light gray granite rock, used principally uilding and cemetery work. One steam-power derrick is used. The is hauled to Loomis in the rough, at a cost of $7 per car, and ped to Sacramento, where the cutting is done. Six men are loyed at the quarry. A. W. Turner, of Loomis, superintendent.

*opp's (Copp & Waters) Quarry.*—See our XIIth Report, p. 385. It is le S.E. of Rocklin, in the N.W. ¼ Sec. 29, T. 11 N., R. 7 E., at about elevation. The open cut is about 100′x 200′ and 80′ deep. Four n-power derricks are used. The stone quarried is largely used for ts, foundations, monuments, and buildings; 10 quarrymen, 5 stone- ers, and 3 laborers are employed. R. H. Copp, of Rocklin, owner.

*unn's Quarry.*—It is in Rocklin, on leased ground, in Sec. 29, T. N., R. 7 E. Two horse-power derricks are used. Three men are loyed, cutting curbing. D. Dunn, of Rocklin, manager.

*ureka Quarry.*—See our XIIth Report, p. 385. It is in Rocklin, in N.W. ¼ Sec. 29, T. 11 N., R. 7 E. The open cut is 75′x 200′ and 70′ . Three steam-power derricks are used, and 6 quarrymen and 6 ecutters are employed. J. P. Allen, of Rocklin, manager.

*letcher's, L., Quarry.*—It is a small quarry on Granite Street in Rock- and worked intermittently. Nine men are employed when the quarry erated. L. Fletcher, of Rocklin, owner.

*riffith Quarry and Polishing Works.*—See our XIIth Report, p. 385. y are ½ mile E. of Penryn. Idle. D. Griffith, of Penryn, manager.

*rimes' Quarry.*—It is a small quarry, 2 miles E. of Lincoln. Four are employed, getting out curbing. Amos Grimes, of Lincoln, wer.

*oyt's Quarry.*—It is in the eastern part of Rocklin, in S.E. ¼ Sec. T. 11 N., R. 7 E., at 265′ elevation. Four men are employed, get- out curbing. Howard Hoyt, of Rocklin, owner.

*ytimen & Wickman's Quarry.*—It is ¾ of a mile S. of Rocklin, on d land, in the N.E. ¼ Sec. 29, T. 11 N., R. 7 E. The open cut 00′x 150′ and 60′ deep; one steam-power and two horse-power der- s are used. Four men are employed, getting out curbing. Hytimen ickman, of Rocklin, managers.

*I X L (Jeter) Quarry.*—It is 2 miles E. of Lincoln, at about 0 elevation. The open cut is about 40'x100' and 40' deep. Two ho e-power derricks are used. The stone is used for cemetery and buil g purposes. There are 4 quarrymen and 8 stonecutters at w k. T. H. Jeter, of Lincoln, owner.

*Jacobson's Quarry.*—It is a small quarry in Rocklin, 25'x 50' d 30' deep. One derrick is used, and 5 men are employed. —Jacob n, of Rocklin, manager.

*Jeter Quarry.*—See I X L Quarry.

*Johnson's, M., Quarry.*—It is a small quarry at Rocklin, in the S. ¼ Sec. 19, T. 11 N., R. 7 E. One horse-power derrick is used, an 4 men are employed, getting out curbing.

*Kent Quarry.*—See our XIIth Report, p. 385. It is at Rocklin, d practically abandoned.

*Loomis Quarry.*—It is ½ mile S. of Loomis, at 385' elevation. e open cut is 60'x150' and 65' deep. Two steam-power and two ho e-power derricks are used. Five men are employed. M. J. Haley, f Loomis, owner.

*Mantyla's Quarry.*—It is at Rocklin, near the center of Sec. 19, T 1 N., R. 7 E. The open cut is about 100'x200' and 40' deep. Two ste n-power derricks are used. It is worked intermittently, and 5 qua r-men and 5 stonecutters are employed when running. John Mant a, of Rocklin, manager.

*McDonald's Quarry.*—It is a small quarry, 2½ miles S.E. of Linc n. Four quarrymen and 2 stonecutters are employed. C. J. McDon d, of Lincoln, owner.

*Quinn's Quarry.*—See our XIIth Report, p. 385. It is at Rock n. The open quarry is 125' and 75' deep. Two steam-power derricks e used. Three quarrymen, 3 stonecutters, and 2 laborers are emplo d. Mrs. Mary Quinn, of Rocklin, owner; Quinn Bros., of Rocklin, m - agers.

*Roberts & Fippins' Quarry and Stone Works.*—The works are at P - ryn and the quarry is 1 mile S.E. of it. Gray granitic rock is quar d from a large outcrop, and the workings do not extend below the gen l surface. It is darker than the Rocklin granite, and shows a mar d contrast between polished and rough surface. The works consist o a 14 H.P. engine and boiler, a double lathe for turning columns, u , vases, etc., and machinery for polishing both flat and curved surfa , moldings, etc. Three quarrymen, 3 stonecutters, and 3 millmen e employed. D. A. Roberts and A. B. Fippins, of Penryn, owners.

*Rocklin Granite Co.'s Quarry.*—See our XIIth Report, p. 386. It i t Rocklin, on leased land, in the S.W. ¼ Sec. 20, T. 11 N., R. 7 E. T e quarry is 150'x 250' and about 100' deep. The equipment consists f five steam-power derricks, each of which is capable of hoisting blo s weighing 25 tons each, one traveling crane for handling stone in e sheds, one McDonald stone-cutting machine, one 40 H.P. engine a l boiler. The "Knox blast" is used in the quarry. Ten quarrym , 16 stonecutters, and 5 laborers are employed. E. M. Hall, Jr., of O - land, secretary; J. L. Delano, of Rocklin, president and manager.

## San Bernardino County.

*Sherer Quarries.*—They are 2 miles S. of Oro Grande, at the side of Southern California R. R. John Sherer, of Victor, owner.

Eureka Granite Quarry.

Rocklin Granite Company's Quarry.

## San Diego County.

*Waterman Quarry.*—It is at Fosters, the present northern terminus of the Cuyamaca and Eastern R. R. It was opened in 1894 for the purpose of quarrying massive blocks of stone for the jetty near Point Loma, at the entrance to San Diego harbor. The contract having been completed, the quarry is now idle and machinery removed. W. S. Waterman, of San Diego, owner.

## San Luis Obispo County.

*Lee's Quarry.*—It is 4 miles N.W. from San Luis Obispo, at about 4[illegible]' elevation. The rock is a hard, light gray porphyry, in which the feldspar is partially decomposed. The trimmings for the court-house at San Luis Obispo are said to have been taken from this quarry, and considerable rock from it has been used for railway culverts, bridges, etc. The rock is broken by joint planes, which makes it more or less difficult to get good dimension stone. It is worked by an open cut, 25'x 75' and 2[illegible]' deep. Idle. Charles Lee, of San Luis Obispo, owner.

*Morro Rock Quarry.*—It is near the base of Morro Rock, a conical-shaped peak at the entrance of Morro Bay, and is about 600' altitude. The rock is a hard, light gray porphyry, in which the feldspar is slightly decomposed. It breaks regularly, and good dimension stone may be easily obtained. It is quarried by contract, and loaded from the quarry on barges by a steam-power derrick. The principal part of the rock quarried is used in constructing a breakwater at Port Harford, and a limited quantity for buildings. The quarry is on a Government reservation.

## Shasta County.

*Masterton Bros.' Quarry.*—It is on Brandy Creek, 1½ miles S. of Stella. The granite is coarse-grained, dark, and similar to the Lincoln granite, in Placer County. Only bowlders are worked, into curbing and coping; the quality being hardly fine enough for monumental work. Pieces 2' 10"x 10' are produced. Four men are at work—2 quarrymen and 2 stonecutters. Masterton Bros., of Redding, owners.

## Trinity County.

*Rush Creek Quarry.*—See our XIIth Report, p. 387. This is situated on Rush Creek, 6 miles E. of Weaverville, and contains 40 acres. At present only bowlders are worked. The granite is fine-grained, free from iron, and not very hard. Seven stonecutters are employed. Masterton Bros., of Red Bluff, Tehama County, owners.

## Tulare County.

*Griffith & Owens' Quarry.*—See our XIIth Report, p. 387. It is 3½ miles E. of Exeter, on the S. P. R. R. and on the eastern base of Rocky Hill. Practically idle. Griffith & Owens, of Exeter, owners.

## MACADAM.

### Alameda County.

*California Improvement Co.'s Quarry.*—See our XIIth Report, p. 38. It is on the Laundry Farm, on the summit of a ridge, 1 mile N. of Mills College, at about 1,000′ elevation. A gravity tramway conveys the rock from the quarry to the crusher and bins at the terminus of the California R. R. The rock is a variety of basalt, and is used for macadam and concrete. Forty-five men are employed during summer. W. M. Rank, of No. 1003½ Broadway, Oakland, manager; Frank Fitzpatrick, of Fruitvale, superintendent.

*Claremont Quarry and Paving Co.'s Quarry.*—See our XIIth Report, p. 388. It is at Claremont, in the foothills between Oakland and Berkeley. The rock is a massive sandstone. The quarry is worked intermittently. Five men are employed.

*East Oakland Contracting and Paving Co.'s Quarry.*—It is on the side of a hill 3 miles E. of Oakland, and is worked intermittently. Twenty to forty men are employed when operating. E. P. Vandercook, of Ninth Street, near Broadway, Oakland, manager; W. O. Badgley, of Ninth Street, Oakland, secretary.

*Haywards Contracting and Paving Co.'s Quarry.*—It is 3½ miles S.E. of Haywards and ½ mile E. of the railroad. The rock is a metamorphosed gray sandstone, incorrectly called "blue trap." It is used for road and street work. The quarry is worked intermittently. Sixteen men are employed when operating. J. D. Smalley, of Haywards, manager.

*Oakland Paving Co.'s Quarry.*—See our XIth and XIIth Reports, pp. 125 and 388. It is on McAdam Street, near Broadway, Oakland. The rock is a metamorphosed sandstone, which contains more or less lime. It is extensively used for macadamizing and concrete work. There are Gates and a Blake crusher, to which the rock is brought on incline by steam-hoist. One crusher is now at work, crushing about 300 cu. yds. daily. Thirty-six men are employed, and when both crushers are running 50 men are required. Charles E. Blake, of Central Bank Building, Oakland, secretary; M. H. Eastman, superintendent.

*Piedmont Paving Co.'s Quarry.*—See our XIIth Report, p. 388. It is in the foothills near Piedmont. The rock is a grained metamorphosed sandstone, and is used for macadam and concrete. It has been idle for two years, but preparations are made to resume work. C. D. Bates of Oakland, manager.

### Los Angeles County.

Nearly all the macadam used in the City of Los Angeles is brought from a neighboring county.

*Pacific Clay Manufacturing Co.'s Macadam Works.*—They are situated at Los Angeles. In 1895 the output of crushed rock was 2,700 tons; price, $1 25 per ton. The rock is obtained from bowlders in the Arroyo Seco, in East Los Angeles. L. S. Porter, of No. 651 Broadway, secretary.

## Marin County.

*Forbes Quarry.*—See our XIIth Report, p. 389. It lies at San Rafael. The plant consists of a Blake crusher, driven by a 16 H.P. engine. During 1895, 1,100 cu. yds. of macadam was made. E. Schwiesau, of San Rafael, owner.

*Hotaling Quarry.*—See our XIIth Report, p. 389. It lies at San Rafael. The rock is a tough blue sandstone, and is used for curbstones, gutter-blocks, macadam, etc. The product for 1895 was 5,000 cu. ft. of gutter-blocks, 2,000 cu. ft. of curbstones, and 100 cu. yds. of macadam. A. P. Hotaling, of San Rafael, owner; E. Schwiesau, of San Rafael, lessee.

*Parrott Quarry.*—See our XIIth Report, p. 389. Idle.

## Sacramento County.

*The Folsom State Quarry.*—The site of the quarry which has been opened under the direction of the Bureau of Highways, is on the south side of the American River, on the ground of the State Prison at Represa. At the request of the Bureau of Highways a mineralogical and geological examination was made of the locality by W. H. Storms, Field Assistant of this Department. A synopsis of his report is here given. The excavation for the canal of the Folsom Water Power Co. has made a large and continuous exposure of rock in place, extending from the dam, half a mile above the prison, to a point a mile or more below it. An examination was made along this canal for a distance of 7,500′ to ascertain the character of the rock exposed and to determine its adaptability for macadamizing roadways. From the dam to a point a few feet south of the prison power-house the rock is all grano-diorite (locally called granite) of even texture and gray color. Where not decayed from surface weathering it makes a superior building-stone—all the prison buildings are constructed of it. At a point directly opposite the main entrance of the prison the grano-diorite gives place to a dark-colored amphibole rock, probably altered diorite. The contact is not sharply defined. The grano-diorite is evidently the younger and includes many masses of the amphibole rock in its magma. Beyond the brecciated zone the amphibole rock is quite uniform in texture and is found to consist largely of hornblende and feldspar, the latter usually subordinate. Quartz is also noticed in some specimens. The rock as a whole is hard and tough, and will no doubt make good macadam. This rock, most of which is massive and suitable for the purpose, extends 2,000′ along the bank of the canal and several hundred feet back from the river—practically an inexhaustible supply.

## San Francisco County.

The quarrying of rock for macadam, concrete, rubble, ashlar, etc., in various parts of the City of San Francisco is continued uninterruptedly, and is an industry giving employment to a large number of men. Within the past two years, one of the principal quarries, the Blue Rock, has produced a quantity of handsome, dark-colored stone, which has been employed in the construction of buildings. This stone was largely

used in the new lodge erected at the Oak Street entrance of Go... Gate Park.

*Blue Rock Quarry.*—See our XIIth Report, p. 389. It is on Dou... near Twenty-sixth Street, and is the only quarry in the county pro... ing a stone suitable for ashlar. A large rock-face is now exposed, ... an improvement in the quality of the stone is quite noticeable. Th... men are employed. Gray Bros., of San Francisco, owners.

*Crocker (Eureka) Quarry.*—See our XIIth Report, p. 390. It is a... corner of Twentieth Street and Corbett Road. Red rock (jaspe... quarried here for concrete, macadam, etc. Twelve men are emplo... Nathan Crocker, of San Francisco, owner.

*Cushing & Wetmore Co.'s Quarry.*—It is on the N.E. side of Teleg... Hill, on Lombard Street. Rock for macadam is the product of ... quarry. Cushing & Wetmore Co., of San Francisco, owners.

*Flint Tract Quarry.*—See our XIIth Report, p. 390. It is at ... corner of Tilden and South Broderick streets. Diggins Bros., of ... Francisco, owners.

*Park Quarry.*—On the north side of Strawberry Hill, in Golden ... Park, is a quarry from which rock is obtained for use on the Park d... ways. It is worked as required.

*Sherer (Wegscheider) Quarry.*—See our XIIth Report, p. 390. ... on the Flint tract, on Sixteenth Street, between Douglas and Osbo... Red jasper for macadam and concrete is produced. Eleven men ... employed. Joseph Sherer, of San Francisco, owner.

*Spring Valley Water Co.'s Quarry.*—It is ½ mile south of the ... entrance of Golden Gate Park. It is worked to supply crushed ... as required by the company.

*Telegraph Hill Quarry.*—See our XIIth Report, p. 390. It is on ... east side of Telegraph Hill, on Sansome Street. Rock for macad... concrete, ballast, etc., is obtained here. Gray Bros., of San Franci... owners.

## Santa Clara County.

*Porter's, W. R. (Gay), Quarry.*—See our XIIth Report, p. 399. I... near Hillsdale, 3 miles S. of San José. Paving-blocks were form... made, but recently a new stone-crusher, of 300 tons daily capac... steam-engine, and boiler have been put up at the quarry, and ... macadam is produced. The quarry is a conical-shaped cut, 200 ... diameter at the top and 60′ at the bottom. The rock is dark gray ... hard in the bottom of the cut, but partially disintegrated nearer ... surface. H. B. Burns, of San José, superintendent.

## Shasta County.

*Blue Limestone.*—Excellent blue limestones are to be found in l... bodies on Government land on Clear Creek, in the Horsetown Distr... 3 miles from Centerville; also on and near Bass ranch, on Stillw... Creek, though not as dark colored; likewise on Soda Creek, near ... tella, in proximity to the railroad.

## Solano County.

*enicia Rock-Crushing Co.'s Quarry.*—See our XIIth Report, p. 390. t on the S. P. R. R., 1 mile N. of Goodyear Station, at about 60′ ele- on. The quarry is on the side of a low hill which is composed of s of volcanic origin, and said to contain considerable sulphur and . It is used for concrete and the macadamizing of roads, streets, and is said to cement itself together into a hard, durable roadbed. crushers are employed; total capacity, 250 tons daily. It is worked rmittently, and 16 men are employed when it is operated. S. ason, of Benicia, secretary; J. H. Hoyt, of Benicia, superintendent.

*ickey's Quarry.*—See Marble, Limestone, and Lime.

*homason Quarry.*—See our XIIth Report, p. 390. It is on an isolated, p, basalt hill, 1 mile E. of Cordelia, at about 250′ elevation. The lt exhibits a tendency toward columnar structure. The quarry sists of three large open cuts on the brow of the hill. The rock taken m them is lowered in cars on an incline, 530′ long, to the Gates her, of 200 tons daily capacity. Both macadam and paving-blocks produced. Thirty-five men are employed. E. B. Thomason, of San ncisco, owner; G. L. Fry, of Cordelia, superintendent.

## Sonoma County.

*etaluma Paving Co.'s Works.*—See our XIIth Report, p. 390. They mile S. of Petaluma. During 1895 the works have been idle most he time; only 1,000 cu. yds. of rock was crushed. J. L. Hall, of luma, superintendent.

# MARBLE, LIMESTONE, LIME.

## Amador County.

*arrara Marble Quarry.*—See our VIIIth and XIIth Reports, pp. 104 391. It is 6½ miles N.E. of Jackson, on Sutter Creek. Not worked dily.

*leta Marble Quarry.*—See our VIIIth and XIIth Reports, pp. 104 391. It is 3 miles S.W. of Oleta. It produces marble of good lity. Worked as the demand requires.

## Calaveras County.

*aldwell Quarry.*—See our XIIth Report, p. 391. It is 4 miles S.W. n North Branch. The marble is of fine quality and takes a high sh. The quarry is not worked regularly. Edward Caldwell, of ley Springs, owner.

White, gray, and banded marble is found in many places in Calaveras nty, but is not quarried. The belt passing through Tuolumne nty extends northward through Calaveras, and is found near Valle- , Murphy, and Cave City.

## Contra Costa County.

*Galindo Ranch.*—An extensive deposit of light gray limestone o here, 3 miles S.E. of Concord. Lime was burned from it years ago is also suitable for macadam.

## El Dorado County.

*Bind & Co.'s Marble Quarry.*—See our XIIth Report, p. 391. It o Weber Creek, 4 miles E. of Diamond Springs and 5 miles S.E. of Pl ville. Idle. E. Bind, of Placerville, owner.

*Cave Valley Lime Co.*—See our XIIth Report, p. 391. Its quarry miles S.E. from Auburn, Placer County. Idle. W. Davis and H Cowell, of San Francisco, owners.

*Holmes Quarry.*—It is at Alabaster Cave, at an elevation of 450', has one kiln of 14,000 lbs. capacity, employing 6 men. H. F. Ho of San Francisco, owner.

*Swisler Quarry.*—It is 5 miles S.E. of Placerville, with four old-s ioned kilns. Idle. Hon. C. A. Swisler, of Placerville, owner.

## Fresno County.

A heavy ledge of blue limestone, suitable for lime, outcrops at Sa son Flat, on Kings River.

Near Dunlap a 30' vein of calcite is found in the syenite, the material for lime.

## Inyo County.

*Inyo Marble Co.*—See our Xth and XIIth Reports, pp. 215 and Its quarries lie on the western base of the Inyo range, between K and Lone Pine. During 1895 the company shipped about $50,000 w of marble. M. J. McDonald, Mills Building, San Francisco, presi

At the western base of the Inyo range, 6 miles E. of Big Pine, l bed of white rock made up almost entirely of the debris of shells covers an area of 3,000 acres, and is perhaps 10' thick. It contai trace of phosphoric acid, and may be of value as a fertilizer. M Rocheford, of Big Pine, owner.

## Kern County.

Metamorphosed limestone occurs in a number of places in the hills 2 to 5 miles S. and S.E. of Tehachapi. It is suitable for ma lime, but too much broken for building purposes.

*Lee's, Thos., Quarry.*—It is at the mouth of a cañon 3 miles S.W Tehachapi, at about 4,200' altitude. The quarry is a small open and the lime is burned in an ordinary "pot kiln" of 600 bbls. capa per charge.

*Seeger's, Henry, Quarry.*—It is ½ mile S. of Lee's quarry, at 4,500' tude. Ordinary "pot kilns" are used, and it is worked irregularly.

*Union Lime Co.'s Works.*—They are in a narrow cañon, 3 miles Tehachapi, at about 4,300' altitude. Limestone is quarried from vast bodies which outcrop on the sides of the cañon. Three patent

ous kilns are used, which have a total capacity of 150 bbls. daily, about 35,000 bbls. are burned annually. Wood for fuel is abundant. ty men are employed. George W. North, of Los Angeles, secretary; k Weehan, of Tehachapi, superintendent.

## Lake County.

wo occurrences of lime. See our XIIth Report, p. 392.

## Los Angeles County.

*ntelope Valley Marble Quarry.*—It is situated in Antelope Valley, niles N.E. of Lancaster. J. Rebman, of No. 317 Byrne Block, Los eles, secretary.

## Madera County.

arble suitable for structural use is found on the Chowchilla River, 3 s N.E. of Grub Gulch. No quarries have been opened.

## Mariposa County.

arble of excellent quality and fine texture is found near the Hite , in the cañon of the South Fork of Merced River. Undeveloped.

## Mono County.

*anchard & Davidson's Quarry.*—It is 6 miles S.E. of Bodie, in Mono , at 7,250′ elevation. The ledge, 15′ to 30′ through, stands in high . The egg-shaped kiln is 12′x 16′ and has a capacity of 30 tons. vered in Bodie, it sells for $35 per ton and is largely used by the ide works. Blanchard & Davidson, of Bodie, owners.

## Monterey County.

*lson Creek.*—See our XIIth Report, p. 392. Undeveloped.
*ckland Lime and Lumber Co.'s Quarry.*—See our VIIIth and XIIth rts, pp. 410 and 392. It is near the coast, between two branches of Creek, 30 miles S.E. of Point Sur. The deposit is extensive, but broken for building-stone. It is suitable for lime, macadam, etc. continuous kilns were erected several years ago. Idle. J. S. ley, of Alameda, manager.

## Napa County.

small quantity is made in Pope Valley. Two kilns are in constant

## San Benito County.

*enega Lime Co.'s Quarry.*—See our VIIIth and XIIth Reports, pp. nd 393. It is on Cienega Creek, 13 miles S. of Tres Pinos, by road, out 960′ altitude. The metamorphosed limestone occurs in a large

mass on the north side of the creek, and in contact with granitic ro
It varies from granular to wholly crystalline, and from white to g
It is too much broken by joints to be valuable for building-stone, bu
said to make first-class lime. The works consist of four patent c
tinuous kilns of 50 bbls. daily capacity each. Seven quarrymen
kilnmen, and 4 coopers are employed. The product is hauled to '
Pinos for shipment. D. N. Tupper, of San José, manager; F. A. E
of Paicines, superintendent.

*Granite Rock Co.'s Quarry.*—It is in the northwest corner of the cou
and on the south side of Pajaro River, at about 200′ altitude. The r
is disintegrated on the surface into a finely divided material, used
top-dressing of roads, walks, etc., and the harder rock is crushed
macadam. The quarry is favorably situated both for handling
shipping the rock. The works are new, and consist of a steam-eng
boiler, crusher of 15 tons daily capacity, and rock-bins from which
rock passes to the railroad cars. Fourteen men are employed w
running. H. S. Fletcher, of Watsonville, manager.

## San Bernardino County.

*Black Hawk Mountains*, 30 miles E. of Victor, show white marbl
excellent quality, but not worked.

*California Portland Cement Works.*—This company, whose plant i
Colton, manufactures, besides cement (q. v.), lime from the poorer c
of limestone broken in the quarry. While it may be considere
by-product, the lime is of excellent quality, and it constitutes quite
important industry. California Portland Cement Works Co., of
Angeles, owner; F. N. Spear, of Colton, superintendent.

*Gem (Kimball) Quarries.*—See our XIth and XIIth Reports, pp.
and 394. They are 14 miles N.E. of Victor. These quarries prod
variegated marbles of great beauty, used largely in the interior dec
tion of buildings. G. W. Kimball, of National City, owner.

*Oro Grande Lime Co.'s Quarries and Kilns.*—The quarries are 1 m
E. of Oro Grande, and the kilns near the railroad. Idle. J. L. Mor
of San Bernardino, superintendent.

*Union Lime Co.'s Quarries and Kilns.*—The quarries are ½ mile F
Oro Grande, and the kilns at the railroad. Idle. T. Thomas, of
Grande, superintendent.

## Santa Clara County.

*Clark Ranch.*—It is 7 miles E. of Madrone. An undeveloped dep
of limestone is said to occur on the ranch.

*Guadaloupe Lime Co.'s Quarry.*—See our VIIIth, Xth, and XI
Reports, pp. 543, 619, and 394. It is on Guadaloupe Creek, 7 miles
of Los Gatos. Idle.

*Los Gatos Lime Co.'s Quarry.*—See our VIIIth, Xth, and XI
Reports, pp. 544, 619, and 394. It is on the side of a mountain 2½ m
S. of Los Gatos, at 700′ elevation, and the kiln is at Los Gatos. Idle.
W. Taylor, of San Francisco, owner.

## Santa Cruz County.

xtensive deposits of metamorphosed limestone lie, in more or less
onnected masses, on both sides of the belt of granitic rocks N.W. of
a Cruz and W. of the San Lorenzo River, and are more extensively
ibuted on the southwestern side of the granitic rocks than on the
heastern. In places they are wholly crystalline, with the individual
als unusually large. The rocks have been greatly broken by pres-
and come out of the quarries in small angular blocks, for the most
too small for dimension stone for building purposes. A limited
tity has been quarried for curbing in Santa Cruz. Its use is prin-
ly for lime, although a considerable quantity is used by the sugar
ries at Watsonville and Alvarado. It is also used for macadam
concrete work. Its colors vary from almost clear white to light
and gray.

*Henry Cowell Lime Co.'s* (*Santa Cruz Lime Co.'s*) *Quarry.*—See our
I th and XIIth Reports, pp. 554 and 395. They lie in two groups, 1
2½ miles N.W. of Santa Cruz, at 300′ to 700′ elevation. There are
common kilns at each quarry, and it is stated that the production
m 2,500 to 3,000 bbls. of lime per week, during the summer. Dur-
he winter months they are usually idle. The rock is too coarsely
alline to burn well in continuous kilns. It is carefully assorted
e burning. The upper quarry is about 100′x 200′, and 75′ deep at
ace. The strata dip 30° N.W., are somewhat metamorphosed, and
derably broken by pressure. The lower quarry consists of a num-
f cuts on the outcrop along a ravine, which is channeled through
eposit. The rock is in part coarsely crystalline and in part gran-
or amorphic. The superintendent stated that during the summer
95 they employed 20 men in the quarries, 25 at and around the
, 12 coopers, 30 woodchoppers, and 50 teamsters. The Henry
ll Lime Co., of San Francisco, owner; E. V. Cowell, of Santa Cruz,
intendent.

*K L Lime Co.'s Quarry.*—See our VIIIth and XIIth Reports, pp.
nd 395. The quarries and kilns are 1½ miles N.W. from Felton,
out 800′ altitude. They are worked by two open cuts in outcrops
assive gray limestone, which is much broken. There are three
, whose production is about 35 bbls. per month. Nine cords of
are required to burn 100 bbls. of lime, and the stone loses 45% to 55%
eight by burning. About 40 men are employed during the
mer, divided as follows: 20 in the quarries and at the kilns, 4
rs, 4 stave-makers, 2 teamsters, 2 roustabouts, and 8 to 10 wood-
ers. Blackman & Cerf, of San Francisco, owners; Baruch Cerf,
lton, superintendent.

*Luis de Dero Quarry.*—See our XIIth Report, p. 395. It lies about
les N.W. from Santa Cruz, at about 250′ altitude. It is worked by
en cut, about 250′ long, and 30′ to 40′ deep. The rock is a gray
stone, heavily beaded and considerably broken, and dips 20° N.W.
principally used for macadam and concrete, and a limited quantity
reet-curbing, etc. Between 3,000 and 4,000 tons were sold in 1895.
5 to 20 men are employed, depending upon the demand for the
W. E. Miller, of Santa Cruz, superintendent.

*Turber Quarry.*—It is about 900′ S. of the De Dero quarry and at
st the same elevation. It is worked by a large, irregular, shallow

cut. The rock is light gray in color and varies in structure f coarsely crystalline to granular. Sold principally to the sugar facto About 6,000 tons were sold in 1895. Fifteen men were employed o about four months in that summer. T. J. Thurber, of Santa C owner; H. Sweeney, superintendent.

*The W. T. Holmes Lime Co.'s Quarry.*—See our VIIIth, Xth, and X Reports, pp. 554, 626, and 395. It is located about ½ mile N. of Fel at about 1,200′ elevation. There are two kilns at the quarry and se at Felton. The quarry is on the steep side of a hill and its face is f 100′ to 300′ high. The limestone is much disturbed, broken, metamorphosed to some extent. It lies adjacent to the granitic r which are prevalent in that locality. All that is suitable is bu into lime, and no building-stone or macadam is produced. Fron to 50 men are engaged in and around the quarry and works in sum Wood for fuel is cheap. E. W. Hawkins, of No. 22 Sacramento St San Francisco, secretary; William Russel, superintendent.

## Shasta County.

*Holt & Gregg's Quarry.*—It is 3 miles S. of Kennett, and comp three quarter-sections of land with stone of fine quality, carrying carbonate of lime, 2% magnesia, and 1% silica, making a very pure li stone. One kiln of 30 tons capacity is on the property, which is worked continuously; 3,000 bbls. were burned last season. Two men employed. Holt & Gregg, of Red Bluff, Tehama County, owners.

*McCloud River.*—Cliffs of lime almost 1 mile wide are between Sq Creek and Pitt River, bearing N.W. up the McCloud River.

## Siskiyou County.

*Etna.*—A large deposit of marble is found 3 miles W. of Etna, on road to Sawyer's Bar. It is exposed in a cut made for the wagon-r and seems to be about 800′ thick. In color it varies; some strata white; others mottled or veined with red, green, or black; and still ot are black and green, or black and red. With cheap transportation fa ties it will become valuable.

*Oak Bar.*—Cloudy marble crops above the town of Oak Bar Klamath River.

*On Thompson Creek*, 10 miles above Happy Camp and 2 miles f the Klamath River, occurs a large bed of valuable marble. The s is hard and takes a good polish. The crystals are large, white, translucent mixed, which gives a pretty combination. John C. W of Seiad, owner.

## Solano County.

*Dickey's, A. A., Quarry.*—See our Xth and XIIth Reports, pp. 670 395. It is on the west side of a hill, on A. A. Dickey's ranch, 4 n E. of Suisun, at about 375′ elevation. The marble or metamorph limestone is of a massive nature and so broken into angular blocks renders it unsuitable for building-stone. The greater part of it is for flux in the Selby smelting works at Vallejo Junction, and remainder crushed for macadam and concrete. It is worked only ing the summer. Nine men are employed.

### Sonoma County.

imestone is found near Geyserville; see our XIIth Report, p. 396.

### Trinity County.

strong bed of gray marble crops out across the North Fork of rinity River near the mouth of East Fork. A short distance above elor Flat a ledge of marble crosses Trinity River.

### Tulare County.

n the road to South Tule Indian Reservation, 8 miles S.E. of Porter-i:, a dark gray marble suitable for building purposes is found. Robert a es, of Porterville, owner.

t *Three Rivers*, 25 miles E. of Visalia, a blue-black marble occurs, rh:h is suitable for lime and for building-stone.

### Tuolumne County.

*olumbia Marble Quarries.*—See our XIth and XIIth Reports, pp. 506 n 396. They are 2½ miles N. of Columbia, and have been worked o inuously during the past two years; mostly on orders for local nrket. The marble—white, gray, banded, and rose-mottled—is emarkable for its evenness of grain and its elasticity. Sheets of con-ic:rable area have been sawed not more than $\frac{1}{16}$″ in thickness. Its n aring qualities are well shown in the marble sidewalk laid in 1878 r nd the Palace Hotel in San Francisco, the material of which came rc these quarries. Six men are employed. Columbia Marble Quarry Co of San Francisco, owner; W. D. Bannister, of Columbia, superin-en ent.

broad belt of *limestone*, with occasional spots of good marble, extends hugh this county in a northwesterly direction, passing W. of Buchanan, E. f Sonora, and through Columbia. It has been opened at numerous pl es, but none of these quarries, except those near Columbia, are w ked. The Stanislaus Cañon is cut down 1,000′ through this belt, rh:h is about 3,000′ wide.

## PAVING-BLOCKS.

### Marin County.

*allagher Quarry.*—It is 3 miles N. of Novato, and produced during 18, 125,000 blocks. J. Gallagher, of Novato, owner.

score or more of quarries exist, but on account of the decreased demand are idle. See our XIIth Report, p. 396.

### Napa County.

*sen Quarry.*—It is 2 miles N.E. of Napa, and consists of a dark ra yte, similar to that in Sonoma County. Five hundred blocks are ma e per day and shipped by boat to San Francisco. Capt. J. Olsen, f apa, owner.

## Solano County.

*McNaughten's, A., Quarry.*—It is on an isolated hill 1¼ miles N. Cordelia. Basalt has been quarried from a number of small cuts made into paving-blocks. Idle.

*Thomason Quarry.*—See Macadam. It is 1 mile E. of Cordelia. paving-blocks and macadam are produced. E. B. Thomason, of Francisco, owner.

## Sonoma County.

The demand for paving-blocks is decreasing from year to year, o to the introduction of asphalt and bituminous-rock pavement. Of 2,332,000 paving-blocks produced in California in 1895 and used in Francisco, Oakland, Sacramento, Stockton, and San José, 2,136,000 furnished by Sonoma County.

*Barnes Quarry.*—See our XIIth Report, p. 396. It is 2 miles Penn's Grove. The product for 1895 is about 20,000 blocks. A. Ba of Penn's Grove, owner.

*Boca Quarry.*—See our XIIth Report, p. 396. This is 1½ miles Glen Ellen. During 1895, 8,000 blocks were shipped. Boca Bro Glen Ellen, owners.

*Borg Quarry.*—See our XIIth Report, p. 396. Located near Mel Idle since 1894.

*Clute Quarry.*—See our XIIth Report, p. 396. This is near S Rosa. In 1895, 70,000 blocks were made. A. B. Clute, of San Franc owner.

*Cooney Quarry.*—See our XIIth Report, p. 397. It lies 5 miles of Petaluma, and has been idle most of 1895. P. Cooney, of Petalu owner.

*Cronin Quarry.*—See our XIIth Report, p. 397. It is 1½ miles Petaluma. During 1895, 70,000 blocks were made. P. Cronin Petaluma, owner.

*Davis Quarry.*—See our XIIth Report, p. 397. This is 2 miles Penn's Grove. The product for 1895 was 25,000 blocks. E. W. Dav Penn's Grove, owner.

*Dickinson Quarry.*—See our XIIth Report, p. 397. It is 7 miles of Petaluma. Only 10,000 blocks were made during 1895. D. S. D inson, of Petaluma, owner.

*Elliott Quarry.*—This is near Santa Rosa; 325,000 blocks were n in 1895. McD. Elliott, of Santa Rosa, owner.

*Harding Quarry.*—It lies 5 miles N.E. of Petaluma. The produc 1895 was 85,000 blocks. Lester Harding, of Petaluma, owner.

*Harney Quarry.*—See our XIIth Report, p. 397. This is near Mel During 1895, 60,000 blocks were made. W. Harney, of Santa R owner.

*Landgren Quarry.*—See our XIIth Report, p. 397. In 1895, 20 blocks were made. Fred Landgren, of Santa Rosa, owner.

*Lynch Quarry.*—This is 6 miles E. of Petaluma. The product 1895 was 70,000 blocks. John Lynch, of Petaluma, owner.

*Manuel Quarry.*—See our XIIth Report, p. 397. It is at Kenv Station. In 1895 it produced 1,000,000 blocks. A. Manuel, of I wood, owner.

GOODRICH SANDSTONE QUARRY, SANTA CLARA COUNTY.

SITES SANDSTONE QUARRY, COLUSA COUNTY.

*Maramora Quarry.*—See our XIIth Report, p. 397. It is at Kenwood, and 70,000 blocks were made in 1895. P. Maramora, of Kenwood, owner.

*Maroni Quarry.*—See our XIIth Report, p. 397. It is located at Kenwood. Idle.

*McDonald Quarry.*—This lies 3 miles E. of Santa Rosa. The product for 1895 was 175,000 blocks. M. J. McDonald, of Santa Rosa, owner.

*Pinelli Quarry.*—This lies 3 miles E. of Santa Rosa. The product for 1895 was 75,000 blocks. V. Pinelli, of Santa Rosa, owner.

*Pinelli Quarry.*—See our XIIth Report, p. 397. It is 1 mile W. of Sonoma. During 1895, 25,000 blocks were made. V. Pinelli, of Santa Rosa, owner.

*Roberts Quarry.*—See our XIIth Report, p. 397. It lies 2 miles E. of Penn's Grove. Forty thousand blocks were made in 1895. L. Roberts, of Penn's Grove, owner.

*Schocken Quarry.*—See our XIIth Report, p. 397. It is situated at Sonoma, and produced 200,000 blocks in 1895. G. W. Schocken, of Sonoma, owner.

*Stacy Quarry.*—See our XIIth Report, p. 397. It lies at Kenwood. Idle.

*Thomason Quarry.*—See our XIIth Report, p. 397. This is near Melitta. Idle.

*Violette Quarry.*—See our XIIth Report, p. 397. Situated near Melitta. During 1895, 100,000 blocks were made. G. Violette, of Melitta, owner.

*Weyl Quarry.*—See our XIIth Report, p. 397. It is at Sonoma. Idle.

*Wilkinson Quarry.*—See our XIIth Report, p. 397. This lies at Penn's Grove. Idle.

## SANDSTONE.

### Alameda County.

*Farwell's Quarry.*—See our VIIIth and XIIth Reports, pp. 35 and 388. It is in a cañon tributary to Niles Cañon, 1½ miles N. of the S. P. R. R. The rock is sandstone and is used for building purposes, etc. Idle. William Farwell, of Berkeley, owner.

### Colusa County.

*Sites (O'Neil & Abbot) Quarry.*—See our XIth and XIIth Reports, pp. 18 and 398. It is on the Colusa and Lake Railroad, about ¾ of a mile E. of Sites, at about 400′ elevation. It is a compact sandstone, in layers 5′ to 10′ thick, dips 45° to 55° N.E., and is comparatively easily worked. The plant consists of a Sargent and an Ingersoll drill, a steam channeler, two gang-saws, three derricks, etc., and is run by steam. Idle. Sites Sandstone Co., of No. 315 Montgomery Street, San Francisco, owner; J. N. Burns, of Sites, superintendent.

### Contra Costa County.

The hills about Martinez contain sandstone, which has been quarried to some extent for building purposes some years ago, but for the most part it is too soft to withstand the pressure of large buildings. That on the ranch of James Rankin, near Martinez, is said to be better if

properly selected. Sandstone for road material has been taken from outcrops on C. Baumgarten's ranch, 1½ miles S. of Martinez; from C. W. Rehnert's ranch, 2 miles E. of Martinez, and from the ranches of Avery and Burdell, near Pacheco. Hard blue sandstone and arenaceous shale also occur on the Rehnert place, 4 miles S. of Martinez, which may be used on roads if properly selected and crushed. See our XIth Report, p. 398.

## Del Norte County.

*Edwards' Quarry.*—It is situated 2 miles E. of Crescent City. The rock is a hard, gray and brown metamorphic sandstone, and is of a superior quality. It is used in the vicinity only. — Edwards, of Crescent City, owner.

## Humboldt County.

Hard, gray metamorphic sandstone crops out for a long distance on the road north and south of Trinidad, and is valuable for building purposes.

*Jacoby Creek Quarry.*—See our XIIth Report, p. 399. It lies on Jacoby Creek, 12 miles N.E. of Eureka, and is the largest quarry in the State. The rock is being used for a breakwater at the mouth of Humboldt Bay. During the year 1895 about 210,000 tons of rock were shipped, a large part of which was in blocks weighing several tons. There are nine large derricks, and a smaller (iron) one mounted on a movable car. The rock is loaded on cars of about 10 tons capacity, hauled by locomotives to the pier, and pushed upon large barges, which are towed by a tug-boat to the jetties, where the cars are dumped. One hundred and seventy-five men are employed. They receive 20 cents per hour and are charged 50 cents per day for board. Flannigan, Brawser & Co., of Eureka, owners.

## Mendocino County.

A heavy ledge of yellow-gray sandstone of excellent quality crops out on the headwaters of Orr's Creek, 6 miles W. of Ukiah, and also on Robert's Creek, 5 miles S.W. of Ukiah. Unimproved.

## Monterey County.

*Tassajara.*—A gray and olive-colored sandstone, suitable for building purposes, occurs in large quantities near Tassajara Springs. It overlies the crystalline schists, dips 30° to 45° E., is soft enough to be easily worked, and is said to harden by exposure. The hotel at the springs is built of this stone. It is too far from railroad to be commercially valuable.

## Napa County.

*Gardner Quarry.*—It lies in Wooden Valley, 10 miles E. of Napa, and is only worked occasionally. The rock is a soft gray sandstone. George Gardner, of Napa, owner.

JACOBY SANDSTONE QUARRY.

## San Luis Obispo County.

*Moor's Quarry.*—It is near the P. C. R. R., in Los Berros Valley, ɔout 5 miles S. of Arroyo Grande, at about 300′ altitude. The rock a fine, light-colored sandstone, rather soft, but said to harden by ɛposure, and is a massive, almost horizontal bed, suitable for rough wall, ɪundations, etc. Idle. P. Moor, of Arroyo Grande, owner.

## Santa Barbara County.

*Erickson Quarry.*—It is on the S. P. R. R., 8 miles S.W. of Santa Maria, ; about 300′ altitude. It is a rough gray sandstone, in strata 20″ to 25″ ıick, and dips 45° E. It is suitable for rough masonry and is used rincipally in railroad work. J. B. Erellanas, of Santa Maria, owner.

*Undeveloped Deposits.*—A vast deposit of gray sandstone, suitable for uilding purposes, is in the Santa Ynez Mountains. It outcrops near old Spring Station, on the stage road, and extends many miles, prinpally in massive strata, and dips at various angles.

## Santa Clara County.

*Flynn Quarry.*—See our XIIth Report, p. 399. It is on the Searles ɜtate, 2½ miles S. of Hillsdale. A large quantity of gray, massive ɪndstone is exposed, and a small quantity has been quarried. Idle.

*Gay Quarry.*—See Macadam.

*Goodrich Estate (Greystone) Quarry.*—See our VIIIth, Xth, and .IIth Reports, pp. 546, 618, and 399. It is ½ mile E. of Greystone tation, 10 miles S. of San José. The rock is colored gray and brown, ɪsily worked, and dips 20° N.E. It is extensively used for public uildings. The works consist of two gangs of saws, a cutting and nishing department, and are at Greystone Station. There are three erricks at the quarry and three at the works. Ten men are employed ɪ the quarry, and fifteen at the works, in summer. J. Pfeiffer, of San osé, superintendent.

*Stanford Quarry.*—See our VIIIth, XIth, and XIIth Reports, pp. 47, 618, and 399. It is on the Goodrich estate, at Greystone Station. 'he rock is similar to that of Goodrich estate quarry, and the buildings t the Stanford University are made of it. Idle.

## Shasta County.

*California Sandstone and Construction Co.'s Quarry.*—It is situated n Clear Creek, 3 miles from Girvin's switch or Bell's Ridge, at about 50′ elevation, and comprises 13 acres. The stone is massive, fine-rained, dove-colored, and hardens on exposure. The pit has just ɔeen opened; its dimensions in 1895 were 16′x 50′x 7′. The comɔany use two steam 10 H.P. derricks—one at the quarry of 15 tons apacity, 40′ mast, 61′ boom, and a similar one at the railroad switch, ; miles distant. One Ingersoll channel-bar cutter, for making an 8′ cut, s employed. The present output amounts to one carload (250 cu. ft.) ɔer week. Thirteen men are employed—5 stonecutters, 5 laborers, and ; on machines. California Sandstone and Construction Co., of No. 16 ?ost Street, San Francisco, owner; J. C. Moffit, of Redding, manager.

*Sand Flat Quarry.*—It is 6 miles N.E. of Redding, and is not of a go quality; the sandstone contains salt. Idle.

*Stillwater Quarry.*—It is on Stillwater Creek. Idle.

## Sonoma County.

Good sandstone, suitable for large buildings, is found at Fort Ro See our XIIth Report, p. 400.

## Ventura County.

The Sespe brownstone occupies a prominent place among our stru ural materials. It is a stone of great tensile strength, varying in col from gray to brown and almost black; in some ledges it is fine-graine while in others coarse-grained. The hard Eocene sandstone, of which is an important member, can be traced eastward from the Santa Yn Mountains to the Devil's Gate and the Sespe oil and brownstone di tricts. In the Devil's Gate District, stone claims have been locat which will afford an immense supply of building material when a ra road shall have been built thereto; and in the Sespe District the follo ing quarries have been opened:

*Phœnix Sandstone Quarry.*—It is partly in Sec. 6, T. 4 N., R. 19 W and partly in Sec. 1, T. 4 N., R. 20 W., S. B. B. and M., and is 3½ mil N. of Brownstone Spur. The sandstone strata are 8′ to 12′ thick a dip 75° S. The output in 1895 was 3,000 cu. ft.; price f. o. b. at Brow stone Spur, 50 cents per cubic foot for rough stone, and dressed sto according to contract. Six men are employed. Henley Bros., of Sesp owners.

*Razzle Dazzle Sandstone Quarry.*—It is about 3½ miles N. of Brow stone Spur, on the S. P. R. R. During 1895 work was suspended at th quarry, but the owners quarried loose blocks of stone on land adjoi ing. Fifteen men are employed. Mentone Sandstone Co., owner; D. Kilpatrick, of Sespe, superintendent.

*Mentone Sandstone Works.*—They are at Brownstone Spur. The pla consists of two gang-saws, one rubbing-bed, and one stone-cuttin machine, all run by steam-power. The output during 1895 was 8,4 cu. ft. of dressed and 4,800 cu. ft. of rough-hewn stone. Eighteen m are employed. Mentone Brownstone Co., owner; D. Kilpatrick, superi tendent.

## Yolo County.

*Putah Creek Quarry.*—See our Xth Report, p. 791. It is on the nort side of Putah Creek, at "Devil's Gate," in the southwest corner of t county, at about 200′ elevation. The rock is gray and olive-colore sandstone, principally in massive strata, which dip 65° to 70° N.E., a forms a high ridge through which the creek has cut its channel. It h been used to some extent for building purposes and cemetery work. Idl E. F. Searles, of San Francisco, owner; B. Bertholet, of Winters, supe intendent.

## SLATE.

### El Dorado County.

*Chili Bar Slate Quarry.*—See our VIIIth, IXth, and XIIth Reports, . 199, 283, and 400. It is 3 miles N. of Placerville. Eight men are work. An incorporated company, owner; J. Ruschetti, of Placerville, nager.

*El Dorado Big Tunnel Co.*—See our XIIth Report, p. 401. Gentle nie Mining Co., of Placerville, owner.

*San Francisco Slate Co.*—See our XIIth Report, p. 401. Its quarry is the north side of the American River, 3 miles N. of Placerville. Idle. n Francisco Slate Co., owner; J. R. S. Kymersley, of San Francisco, sident.

*Strahle Quarry.*—See our VIIIth and IXth Reports, pp. 199 and 283. is about 1 mile S. of Kelsey, and is well opened. Worked intermit-tly. Jacob Strahle, of San Francisco, owner.

## STEATITE AND SERPENTINE.

### El Dorado County.

*Darlington Quarry.*—This deposit, from 50′ to 60′ wide, was formerly arried, and is about 3 miles S.E. of Placerville. Idle. A. Darling-n, of Placerville, owner.

### Los Angeles County.

*Banning Serpentine Quarry.*—It is situated on Catalina Island. The tput is principally for ornamental, sanitary, and electrical uses. ghty men are employed. Banning & Co., of No. 222 S. Spring Street, s Angeles, owners.

*Empire Landing Quarries.*—On Catalina Island. See our XIIth Re-rt, p. 402.

### Napa County.

In Chiles Valley, soft, greenish soapstone occurs in seams, 4″ thick, the serpentine.

### Riverside County.

Several veins of white, scaly talc have been discovered 3 miles S.W. Winchester, and some superficial work done. The mineral seems of od quality. F. A. Stephens, of Menifee, owner.

## TRACHYTE, TUFA, ETC.

### Napa County.

*Howell Mountain Quarry.*—It is at Glendale, 3 miles S. of St. Helen The rock is a red and white trachyte, hard enough to be used for lar structures, and weighs 140 lbs. per cubic foot. No regular quarry fa has been made, being worked only occasionally. The product for 18 was about 15,000 cu. ft. E. T. Hill, of St. Helena, owner.

*Manuel Quarry.*—This lies back of the asylum, 2 miles S. of Nap The rock is a very hard, gray trachyte. The quarry is worked on occasionally. A. Manuel, of Napa, owner.

*Newman Quarry.*—This lies on the Berryessa road, 4 miles N.E. Napa. The rock is a fine-grained, hard, gray trachyte, and is used f ashlar and first-class masonry; 400 tons of cut stone were produc during 1895. Newman & Wing, of Napa, owners.

*Rose Quarry.*—It is 1½ miles E. of Calistoga. The rock is a so trachyte tufa, and is used in and near Calistoga for low buildings; too soft for larger structures. David Rose, of Calistoga, owner.

*Salmina Quarry.*—It is 7 miles E. of Napa. The rock is a soft tuf and the quarry is worked only occasionally. Frank Salmina, of Nap owner.

### Sonoma County.

Several localities are mentioned in our XIIth Report, p. 404, whe tufa is quarried occasionally. The rock in Sonoma County is too so and not a desirable building-stone.

### Yolo County.

*Sackett Bros.' Quarry.*—See our Xth Report, p. 791. A whitish vo canic rock has been quarried for building purposes, on Sackett Bro land, 5 miles W. of Winters. It occurs in vast quantities, overlying heavy bed of conglomerate, and is a soft, crumbly rock in places, b hardens to some extent upon exposure. It has been used for rou masonry at Winters.

## TRAVERTINE AND ONYX.

### Mendocino County.

*Aragonite* (California Onyx).—It is reported that a large deposit this mineral has been found in Gravelly Valley.

### Mono County.

The *Travertine Quarry*, situated 1 mile S.E. of Bridgeport, has be further prospected since our last Report (see page 403), and the sou ledge proved to be 30′ deep. Two new springs, with a flow of 5,000 gal in twenty-four hours, have appeared in the quarry; the water of one cool, while that of the other is 90° F. This stone is meeting with muc favor for inside and outside work. California Travertine and Onyx C of San Francisco, owner; H. Mathey, of Bridgeport, manager.

## San Luis Obispo County.

*Kesseler's Quarry.*—See our Xth Report, p. 584. It is in Secs. 9 and 16, T31 S., R. 15 E., 16 miles N.E. of Arroyo Grande, at about 1,800′ altitude. The property consists of 925 acres of patented land, on which are two outcrops of so-called oynx (aragonite), about ½ mile apart. One is milk-white and the other, now worked, is more variegated; it occurs in layers up to 22″ in thickness, which dip 70° E. The quantity of available material has not been definitely ascertained. It is sawed by hand at the quarry into 5′x 6′ blocks, hauled to Arroyo Grande, and shipped by rail to San Francisco, where it is principally used for ornamental purposes. Four men are employed. Frank Kesseler, of San Francisco, manager.

The following analysis by R. L. Packard is from the Report of the U. S. National Museum for 1893, face p. 558:

| | |
|---|---|
| Calcium carbonate ($CaCO_3$) | 93.86 |
| Magnesium carbonate ($MgCO_3$) | 1.43 |
| Iron carbonate ($FeCO_3$) | 3.93 |
| Manganese carbonate ($MnCO_3$) | 0.06 |
| Tricalcic phosphate ($Ca_3[PO_4]_2$) | 0.25 |
| Total | 99.53 |

## Sonoma County.

*Gray-Madeira Onyx Mine.*—It was discovered in the fall of 1895, and is situated at the head of Gillam Creek, a tributary of Austin Creek, 16 miles W. of Healdsburg, at 1,560′ altitude. The aragonite found here is green. It has filled a number of parallel fissures in a belt of serpentine, which courses N.W. and dips 70° W. The mineral incloses masses of magnesite and soft, decomposed serpentine. Some specimens show cavities lined with milky chalcedony; others have their seams of chalcedony between the crystals of aragonite, so as to give it a banded structure. The inclosing silicified serpentine is most beautifully veined with yellow and brown opal, chalcedony, and jasper. It is very hard, and can be had in large blocks, making it a valuable material for tables and mantels. The locality is in the site of an ancient hot spring, now dried up. The geologic formation leads to the assumption that cinnabar may be found there. George Madeira et al., of Healdsburg, owners.

## Yolo County.

*Tolenas Springs Deposit.*—See our Xth and XIIth Reports, pp. 668 and 403. A deposit of so-called onyx (aragonite) exists at Tolenas Springs, 5 miles N. of Suisun, at about 1,000′ elevation. It is principally white and gray colored, occurs in layers of various thickness from 1′ upward, and of uncertain extent. It was formerly quarried to some extent for ornamental purposes. The following analysis of a sample from this deposit, by R. L. Packard, is from the Report of the U. S. National Museum for 1895:

| | |
|---|---|
| Calcium carbonate ($CaCO_3$) | 95.48 |
| Magnesium carbonate ($MgCO_3$) | 2.20 |
| Strontium carbonate ($SrCO_3$) | 1.59 |
| Barium carbonate ($BaCO_3$) | 0.11 |
| Water ($H_2O$) | 0.37 |
| Total | 99.75 |

Tolenas Springs and Onyx Co., owner; W. H. Chittenden, of Suisun, superintendent.

# MISCELLANEOUS.

## ASBESTOS.

### Riverside County.

Several vein-like deposits of asbestos have been found 3 miles S.E. Winchester, on which some surface cuts have been made. The miner seems of fair quality. F. A. Stephens, of Menifee, owner.

## CHRYSOPRASE.

### Tulare County.

This valuable mineral occurs in seams in a ferruginous, silicious roc found on Secs. 5 and 8, T. 18 S., R. 26 E. About $550 worth of rou stone has been sold so far this year.

## DIAMONDS.

### El Dorado County.

Diamonds have recently been found on Perry Creek, and also sever at Smith's Flat, 2 miles E. of Placerville.

## FRENCH CHALK.

### Los Angeles County.

*Banning Quarry*, on Catalina Island; output for 1895, 10,000 lb Price, $15 per ton. Banning & Co., of No. 222 S. Spring Street, L Angeles, owner.

## GRAPHITE.

### Fresno County.

A large body of graphite is found in Drum Valley, 6 miles N. Auckland, Tulare County, on the land of William Kincaid, of Dunla and another body on the Reeves ranch, 3½ miles W. of Dunlap.

Mineral Paint Works, Near Healdsburg.

California Onyx, Near Healdsburg.

## INFUSORIAL EARTH.

### Los Angeles County.

There is a quarry of infusorial earth on Catalina Island. The output in 1895–96 was 10,000 lbs. Price, $60 per ton. Banning & Co., of No. 222 S. Spring Street, Los Angeles, owner.

## MINERAL PAINT.

### Sonoma County.

*Indian Metallic Red Paint Mine.*—See our XIIth Report, p. 406. It lies 7½ miles S.W. of Healdsburg, on Porter Creek. The rock, as it comes from the tunnel, is a very silicious hematite. After a superficial sorting it is crushed and passes to an iron drying drum (heated by a wood fire), which revolves at a slight inclination; thence to the self-feeders of an ordinary 10-stamp mill; thence the dry pulp passes through a coarse bolting-cloth, and the residue (particles of quartz) is thrown away. That which passes through the bolting-cloth is ground between three sets of French burr-stones, and between each set is passed through the finest bolting-cloth. Finally it is passed between iron rollers, one running faster than the other, to give a sliding action, and packed in paper-lined barrels of 300 lbs. each. For a darker grade the ore is mixed in the stamps with a black carbonaceous shale, obtained near the mill. The product for 1895 was about 100 tons. T. S. Merchant et al., of Healdsburg, owners.

*Paint Mine.*—It lies 5 miles N.E. of Cazadero. The location is made on a vein, 200′ wide, of very impure silicious hematite.

*Brown's Ochre Mine.*—This is 2½ miles N. of Occidental. The ochre is a soft volcanic ash of light yellow color, containing little silica. Idle. William Brown, of Occidental, owner.

## PLATINUM.

### Del Norte County.

Platinum is found in the beach sands. In the Crescent City Beach mine ¼ oz. was saved per day. It is also found in the auriferous sands of Smith River, 4 miles E. of Crescent City.

### Humboldt County.

Platinum is found in paying quantities in the beach sands along the coast. In the Union Mine the gold contains about 5%, and in the Little River Mine about 50%.

### Plumas County.

See our XIIth Report, p. 408. Some of the auriferous gravels in hydraulic mines have been found to contain scales of platinum and allied metals, especially along Spanish Creek, and at La Porte.

## Trinity County.

This metal is found in all the tributaries of New River, but parti larly in Devil's Cañon Creek. It also occurs in the North and E forks of Trinity River, and on French Creek near Taylor Flat; on t latter stream the metal is taken out in rather large quantities, and it said that nuggets are sometimes found attached to ore inclosed in dark-colored rock." On the second bench of the main Trinity River is found most abundantly, occurring in some parts in nuggets up to 1 in weight.

# SALT.

## Alameda County.

The recovery of salt from the waters of San Francisco Bay by evapo tion, in the marshes about Newark, Alvarado, Mount Eden, and Russe has become an important source of revenue and one of the leading indu tries of the county. The output per annum is now many thousand to and 300 men or more are employed during the busy season of spring a summer. Recovering salt from the waters is accomplished by allowi the waters during high tide to enter the large vats, surrounded by leve and the gates are then closed. As evaporation progresses the water drawn from one vat to another until the liquor becomes so concentrat that the salt crystallizes out of it. The coarsely crystalline salt th obtained is dried and ground to various degrees of fineness, to suit t purposes desired. Coarse salt is sold to packing-houses, chlorinati works, etc., while that used for table purposes is further dried and grou to a much greater degree of fineness. See our VIIIth and XIIth Repor pp. 30 and 408.

*Barton's Works.*—They are 4 miles W. of Alvarado. Formerly t salt was shipped to San Francisco to be ground and prepared for mark Recently a large warehouse has been erected at the vats, and a mill w be erected, in order that the salt may there be ground and prepared market. About 500 tons were produced in 1895, and 24 men we employed. B. R. Barton, of No. 213 Sacramento Street, San Francis manager; G. W. Sylvester, of Alvarado, superintendent.

*Baumberger's, J., Works.*—They are about 2½ miles S.W. of Mou Eden. About 350 tons are produced annually, and 10 men are employ when the works are operated.

*Carbon Island Salt Co.'s Works.*—They are near the bay, 4 miles of Alvarado. Eight to ten thousand tons are said to be produc annually. From 40 to 50 men are employed in summer, and fro 15 to 20 in winter. P. Peterson, of Alvarado, superintendent.

*Cox's, A., Works.*—They are 2 miles S.W. of Mount Eden. Eigh acres are under levee. Two men are employed.

*Crystal Salt Co.'s Works.*—This company produces salt 1½ miles S. Alvarado, and also near Newark. Twelve men are employed at Alva ado, and 8 at the Newark works. Plummer Bros., of No. 14 Spe Street, San Francisco, owners.

*Marsicano's, P., Works.*—They are 2 miles W. of Mount Eden. Abo 12,000 tons are said to be produced annually. It is shipped to S

ancisco and there ground and prepared for market. From 40 to 50 n are employed in summer.

*Mathewson's, P., Works.*—They are near Russel's Station. Only a all quantity is produced.

*Matson's, C., Works.*—They are near Russel's Station. Only a small antity is produced.

*Micleson's, Mrs. M., Works.*—They are 2½ miles W. of Mount Eden. out 4,000 tons are said to be produced annually. Twelve men are ployed in summer.

*Oliver's, Mrs. E. A., Works.*—They are 2 miles S.W. of Mount Eden. e hundred and sixty acres are under levee, and the mill is located at vats. Twelve men are employed. Oliver Bros., of Mount Eden, nagers.

*Pestdolf's, C., Works.*—They are 1¼ miles W. of Russel's Station. ly a limited quantity is produced.

*Pestdolf's, D., Works.*—They are 1½ miles W. of Russel's Station. ly a limited quantity is produced.

*Quigley's, J., Works.*—They are 1½ miles W. of Alvarado. Three usand tons are produced annually. Twelve men are employed in nmer. E. M. Foley, of Alvarado, superintendent.

*Sinclair's Works.*—They are near Quigley's. Only a limited quantity produced.

*Union City Salt Co.'s Works.*—They are 2 miles W. of Alvarado. elve men are employed in summer and six in winter. Osgood Putn, of No. 401 California Street, San Francisco, manager; Thomas rchgrevink, of Alvarado, superintendent.

*Union Pacific Salt Co.'s Works.*—They are 3½ miles W. of Alvarado, l are perhaps the most important works in the county. They are d to produce 13,000 to 15,000 tons annually, and handle or control greater quantity produced by the smaller companies. The evaporan is largely done in "floored," instead of ordinary "mud" vats, ich are used by other companies. William Barton, of Mount Eden, perintendent.

*Wisby's, L., Works.*—They are 2 miles S.W. of Mount Eden. About 00 tons are said to be produced annually.

## Riverside County.

*New Liverpool Salt Co.'s Works.*—See our XIth and XIIth Reports, . 388 and 409. They are at Salton, in the Colorado Desert. All ormation refused. A. K. Durbrow, of Salton, superintendent.

## San Bernardino County.

*Crystal Salt Co.'s Works.*—They are about 30 miles S. of Danby, at out 500′ elevation. The salt occurs as a residuary deposit on the or of a dry lake. Thin layers of sand and clay are interstratified h the salt beds, and a portion of the deposit has been covered by fting sand. The salt is quarried, hauled by large traction engines oss the desert to Danby, and shipped. Thirty-five tons of salt are uled by a single engine, in wagons built especially for this purpose m thin steel plates. The crude salt is sold for use in silver mills at

Calico, and the best grade is refined and prepared for market. Cry
Salt Co., of San Francisco, owner.

### Shasta County.

*On Salt or Stinking Creek*, 12 miles E. of Redding, is a sandst
strongly impregnated with salt, as are the creek waters. The
effloresces on the sandstone after rains. Formerly some salt was
duced here.

## SODA.

### Inyo County.

*Inyo Development Co.'s Works.*—See our VIIIth and XIIth Repo
pp. 226 and 409. They are on Owens Lake, in the vicinity of Kee
The vats have an area of 70 acres, and are filled with water from
lake to a depth of about 15" as soon as warm weather sets in. T
centrifugal pumps, of 25 H.P. and 10 H.P., keep the depth uniform.
total evaporation of water amounts to about 8' per year. During 18
about 1,900 tons of the crude salt was shipped to the refinery, near
Francisco. The lake water contains soda, borax, lime, salt, and ot
minerals. H. L. Wrinkle, of Keeler, superintendent.

## SULPHUR.

### Lake County.

*Sulphur Banks Mine.*—See our Xth and XIIth Reports, pp. 238
410. Formerly mined for sulphur, but not now.

## ZINC.

### Shasta County.

*Hobbs Mine.*—See our XIIth Report, p. 411. It is 6 miles S. of Ro
Mountain.

# APPENDIX.

The authors of the following papers are alone responsible for all statements of fact and conclusions reached.

## PRESERVATION OF STRUCTURAL TIMBER.

By John D. Isaacs,

Chemist for and in charge of Timber-Preserving Plants of the S. P. Co. (Pacific System).

The importance of the preservation of timber for engineering, mining nd other purposes has long been recognized. This subject has received uch attention among civilized nations during the past two thousand ars. A great variety of preservative agents, and of methods of treatent, have been tried, tested, and abandoned. Many processes have ven such promise of success as to apparently justify large expendires of money in their development, and a few have risen to commerial importance; but most methods, when attempted on a large scale, ve proven failures.

It is not surprising, in view of the general interest in this subject, and the prevailing ignorance of its history, that long known and abanned processes are constantly being revived, and not infrequently the thusiastic inventor succeeds in sinking his own and other people's oney in some project, when an investigation of the state of the art uld show that the assumed discovery has long been anticipated.

For these reasons, it is thought advisable to preface a description of actically successful processes in use with a partial enumeration of ose tried and abandoned. Besides these, there are some processes hich, under certain conditions, are really useful, though not of general plication. A brief description of these will also be given.

Among the Greeks, and later the Romans, the following preservatives ere used: Oils, tars, resins, and pitches from various woods. These ere usually applied superficially, but sometimes holes were bored in e timber to assist penetration. Also, crude soda, common salt, sodium lphate, and bitumen. Sometimes timber was first soaked in a soda or lt solution, and afterward boiled in bitumen. This evaporated the oisture, crystallized the salt, and supplied an exterior protection, hich prevented the washing out of the salt, as well as furnished echanical protection against exterior attack. This last method was

probably used as a protection against the *Teredo navalis*, with which t ancients were well acquainted.

Among the many preservatives tried during the last century, and ear in this, the following may be mentioned: Copperas, bluestone, nitrate silver, corrosive sublimate, sulphate of zinc, carbonate of soda, caust soda, arsenic, barytes, common salt, quicklime, alum, soap, resin, co tar, vegetable oils, fish oils, vapors of oils, powdered charcoal, charrin etc. (See "Preservation of Timber" by Boulton, Van Nostrand, 188 "Preservation of Timber" by Chapman, London, 1817.)

Scarcely a month in the year elapses that some one of the above su stances is not brought to the attention of the writer, sometimes wi much secrecy, as a great discovery. It is undoubtedly a fact tha under favorable circumstances, some of the above preservative agen answer the purpose fairly well, and the inventor can usually show fairly sound piece of timber so treated which has been "alongside of" very much decayed piece not so treated for —— years. Usually t time and extent of the experiment are both limited, and the fact ove looked that the same difference in lasting qualities is observable betwe the sticks of different periods of growth, times of felling, etc., wh neither have had any preservative treatment.

Among later processes the following may be noted:

*Lostal's Process.*—Used in France for the preservation of thin materi such as lagging, for mining purposes. The plank is piled in tanks, wi strips between. It is then covered with quicklime, which is gradual slacked with water. Time of treatment required for 2" plank, abo one week. It is said to work well, and it materially hardens the timb

*Koug's Process.*—The timber is packed in a vertical, closed retort, a filled three fourths full with sodium carbolate. It is then boiled by t introduction of a jet of live steam into the carbolate. This is continu until the retort is filled by condensation of the steam. The timber soaked in the hot liquid for ten to twelve hours. The liquid is drav off, and the timber finally washed with a steam jet. Crude sodiu carbolate may be made by the action of a hot solution of caustic so on coal tar.

*Hock's Process.*—The timber is first seasoned by the use of steam in closed retort. It is then saturated with a solution of paraffin in vol tile kerosene; the surplus drained off; the solvent driven from the ti ber by heat, and recovered in a condenser for future use. This leav paraffin in the pores of the wood. If the drying is thoroughly dor the process is said to be a preventive of dry rot.

In Holland a superficial protection has long been in use for the pr tection of large timbers, piles, etc., used in sluices and flood-gates. T surface of the timber is covered with a mixture of tar and pitch, appli hot, over which is sifted powdered shells, forge scale, and sea sand.

*Payne's Process.*—The timber is impregnated, in closed retorts, with solution of sulphate of iron (copperas), and afterward treated wi lime water. This forms an insoluble exterior coating of gypsu Instead of lime, alkaline carbonates, such as that of soda, have be used.

There are many mixed processes, similar to the last, which consist an injection of one substance, followed by a second. In such cases t first is usually the preservative proper and the last is intended to act a seal, to prevent the evaporation or the leaching out of the form

t in some processes both injections are preservatives. The following some of this class:

| Name of Process. | First Injection. Solution of— | Second Injection. Solution of— |
|---|---|---|
| Jacques | Soap | Tar acids. |
| Richards | Common salt | Alum. |
| Müller | Phosphate of soda | Chloride of barium. |
| Hatzfeld | Tannin | Acetate of iron. |
| Krug | Soda | Creosote. |
| Paulet | Sulphate of copper | Creosote. |
| Wellhouse | Chloride of zinc and glue | Tannin. |

The only one of these now in practical use is the Wellhouse process, hich is really a variety of burnettizing, hereafter described.

*Vulcanizing.*—This is a process peculiar to itself. The timber is ated in closed retorts, under pressure, without seasoning, to a tem- rature sufficient to transform the sap into various organic acids, wood eosote, etc. The difficulties with this process seem to be, (1st) while e preservative constituents may be sufficient in quantity to act some- at like creosote, if they were concentrated near the surface, they are o much distributed for their quantity throughout the timber; and d) wood creosote, which is a part, and probably the most important rt, of the results of the process, is not an effective preservative of wood.

The following is a brief statement of the theory of timber preservation now understood: Timber may be destroyed, *First*—By being eaten ay or consumed by external attack, such as that of the *Teredo navalis*, *mnoria terebrans*, ants, bugs, etc. Almost any dense pitchy sub- nce, insoluble in water, and so applied as to adhere firmly to the terior of the wood, without openings or cracks, will, in a measure, event destruction from this cause. But those preservatives are the ost effective which contain coagulants of albumen, since the spawn of ost of the enemies of timber are albuminous cells, to which contact th such preservatives means instant death. *Second*—By decay, rotting, d dry rot. Like most vitalized bodies, timber begins to decay when eprived of life. This process is brought about by the ever-present yriads of germs in the atmosphere. In this process the nitrogenous rtions of the sap, such as albumen, play an important part. There e, therefore, two ways in which the process of decay may be arrested, d further decay prevented, (*a*) by introducing throughout the timber permanent germicide; (*b*) by destroying with heat, sufficiently pro- nged, those germs already in the timber, coagulating thoroughly the uminous constituents of the sap, and immediately sealing or inclos- g the timber with a protective coat through which fresh germs of decay nnot penetrate. We may, therefore, divide timber preservation, as now acticed, into two general methods:

*First*—Saturating the timber with an antiseptic solution;

*Second*—Sterilizing and desiccating the timber by heat and sealing it th a preservative and protective coat.

During the past fifty years four principal methods of treatment have sumed commercial importance. Three of these belong to the former the above classes, and one to the latter. They are:

(*a*) Impregnation with sulphate of copper, known as Boucherizing.

(*b*) Impregnation with corrosive sublimate, known as Kyanizing.

(*c*) Impregnation with chloride of zinc, known as Burnettizing.

(*d*) Creosoting.

Under these general heads there are many varieties of treatment, b the first two, either from failures, expense, poisonous nature of the su stance used, or other causes, are gradually falling into disuse. So th there remain now in the field practically only the last two.

### BURNETTIZING.

This process was proposed by Sir W. Burnett, in 1838. It has be in constant use in Hanover since 1849, and later has been adopted as standard method throughout Germany and Austria. It was introduc into the United States in 1850, but has been extensively used only with the past twenty years. This process, so far, is principally in use for t treatment of railroad ties, but there seems to be no reason why it shou not be successfully used to prolong the life of timber for mining purpos

The process of Burnettizing is simple. The timber is dried by stea and the antiseptic solution then forced in.

The theory of the use of chloride of zinc is that this substance is bo an antiseptic and a powerful coagulant of albumen.

It is not considered necessary to thoroughly impregnate the timb throughout, during the process of treatment, with the zinc chlori solution, as the salt diffuses itself after treatment, provided a soluti of sufficient strength be first used. Too strong a solution is to avoided, because the zinc combines with constituents of the sap, lib ating hydrochloric acid, which, if too strong, injures the wood fib Practice limits the strength of the solution to a minimum of 1.5% a a maximum of 2.0%. If less than the minimum, it may not be lo effective. If more than the maximum the fiber may be injured.

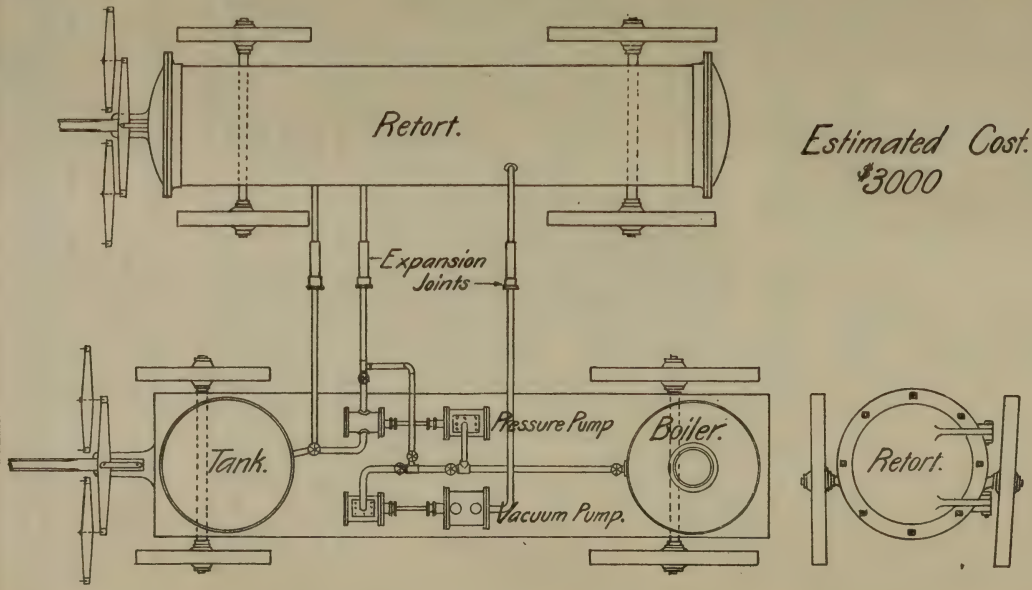
Chloride of zinc is cheaply and easily made by simply immersi zinc in muriatic acid until the acid is saturated, leaving no free acid attack the piping, etc. This salt is now largely manufactured both the Eastern States and on this coast. Its cost in San Francisco is n about 4½ cents per pound in large quantities.

The apparatus for treatment is simple. It consists of one or mo retorts, a boiler, a vacuum pump, a pressure pump, one or more stora tanks, and suitable piping. For short timber a plant could easily arranged to be hauled around on wheels like an ordinary wagon. steam is otherwise available, the boiler can be omitted. With such plant having a retort, say 3½′ to 4′ in diameter, and 16′ long, ve effective work could be done in preserving timber to be used in mines.

The process, in detail, consists in placing the timber to be treated a closed retort, introducing live steam at 30 lbs. pressure, allowing t mixed sap and condensed water to drain off during this steaming, un the liquid shows little or no resinous constituents. Vents are th opened, and the steam blown off. A vacuum is then produced by vacuum pump. This is continued until a condenser shows condens tion at a rate per hour equal to ½ lb. of water per cubic foot of timb The retort is then filled with hot chloride solution, and the requir quantity of solution forced into the timber by a pressure pump. T entire process, with large retorts holding 18,000′ B.M. of timber, usual requires a little less than seven hours' time.

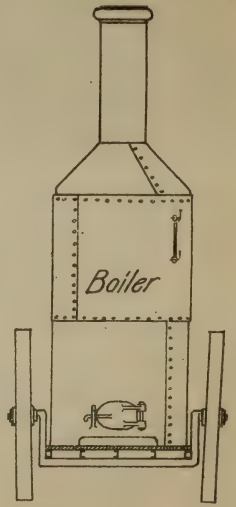
Chloride of zinc alone is not usually regarded as a permanent p servative of timber, but the time to which its use prolongs the life

# PORTABLE BURNETTIZING PLANT.




Estimated Cost.
$3000



timber is not definitely known. It is certain, however, that it effec considerable ultimate economy in the cost of timbering.

It is often asserted that, owing to the extreme solubility of zin chloride, it will soon leach out of timber exposed to rain or to muc moisture. The author thinks that this objection is greatly exaggerate He has attempted to leach this chloride out of timber with runnin water, but could extract only an insignificant portion, even when th timber was in fine shavings. All the chloride could not be taken ou of chips from treated timber by boiling in repeated changes of wate If leaching takes place, it is certainly very slowly. This process ha dens timber considerably. It allows the use of sap and other secon quality timber. In some cases the saving in cost, in this respect, mor than offsets the expense of treatment.

*Protection Against Fire.*—This process renders timber much less com bustible, and is, therefore, valuable as a fire preventive. All solubl chlorides have a great affinity for moisture. They will cause any sub stances, impregnated with them, to remain moist, and, therefore, muc less inflammable than if untreated. Common salt (sodium chloride) ha long been known as a fire preventive for timber. In a paper by M Robert Martin, and in the discussion following (see Trans. Mining Ins of Scotland, Parts 3 and 4, February and April, 1896), will be found a interesting account of the use of a mixture of sodium and magnesiu chlorides for the fire protection of mining timbers. In this paper th remark is made that the "salted timber is easily distinguished from othe timber by its damp appearance."

The Société d'Encouragement de Paris about ten years ago awarded prize of 2,000 francs for a fire-proofing solution to be applied to theatrica scenery, woodwork, etc. The principal effective ingredient of this solu tion was sal ammoniac (ammonium chloride).

Zinc chloride is extremely hygroscopic, much more so than either sa or sal ammoniac. Its affinity for moisture is such that it will keep timb damp in the driest climate. Timber containing an amount of thi chloride sufficient for its preservation cannot be ignited until after th long application of a high temperature. The following experiment have been recently made on the combustibility of burnettized timbe Two boards, each 1″x6″ and 2′ long, as nearly alike as possible, excep that one was burnettized and the other untreated, were placed side b side closely under the grates in the ashpit of a boiler. At the end o forty minutes the untreated stick was entirely consumed; the treate stick was charred one quarter inch deep. Two pieces of burnettize timber, one pine, the other red fir, each 4″ square, and two pieces of th same timber, same size but untreated, were placed on a hot blazing fir simultaneously. The untreated pieces blazed up at once and were con sumed; the burnettized pieces smouldered an hour before they could b ignited. All these pieces were dried as far as possible before the exper ment.

The net cost of burnettizing at San Francisco in large quantities i about $3 per 1,000′ B.M., for treatment.

Burnettizing is largely used by the Southern Pacific Company, th Atchison, Topeka & Santa Fe Company, and many other large rail road systems for the preservation of ties, tunnel and other timber.

In purchasing chloride of zinc the following are recommended specifi cations:

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# BURNETTIZING TABLE.

June, 1896. J. D. I.

| | % Zinc Chloride. | Degrees Beaumé. | Specific Gravity. | Weight per Gal. | PROPORTIONAL PARTS. | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gallons Standard Solution | $1\frac{5}{10}$ | 2¼ | 1.0150 | 8.462 | 1. | 1 068 | 1.135 | 1.203 | 1.271 | 1.339 | 1.407 | 3.151 | 3.230 | 3.309 | 3 388 | 3.466 | 3.545 | 3.624 | 3.703 | 3.782 | 3.860 | 3.939 | 7.878 | 16.439 | 14.795 | 14.679 | 4.708 | 5.105 | 5.956 | 1.914 |
| " " " | $1\frac{6}{10}$ | 2⅜ | 1.0159 | 8.470 | 0.937 | 1. | 1.063 | 1.127 | 1.190 | 1.254 | 1.318 | 2.952 | 3.025 | 3.099 | 3.173 | 3.247 | 3.320 | 3.394 | 3.468 | 3.542 | 3.616 | 3.689 | 7.379 | 15 397 | 13.858 | 13.748 | 4.410 | 4.782 | 5.579 | 1.793 |
| " " " | $1\frac{7}{10}$ | 2½ | 1.0167 | 8.476 | 0.881 | 0.941 | 1. | 1 060 | 1.119 | 1.179 | 1.239 | 2 776 | 2.845 | 2.915 | 2.984 | 3.054 | 3.123 | 3.192 | 3.262 | 3.331 | 3.401 | 3.470 | 6.940 | 14.481 | 13.033 | 12.930 | 4.147 | 4.497 | 5.247 | 1.686 |
| " " " | $1\frac{8}{10}$ | 2⅝ | 1.0175 | 8.483 | 0.831 | 0.888 | 0.944 | 1. | 1.056 | 1.113 | 1.170 | 2.620 | 2 685 | 2.751 | 2 816 | 2.882 | 2.947 | 3.013 | 3.078 | 3.144 | 3.209 | 3.275 | 6.549 | 13.665 | 12.299 | 12.202 | 3.914 | 4.244 | 4.951 | 1.591 |
| " " " | $1\frac{9}{10}$ | 2¾ | 1.0183 | 8.490 | 0.787 | 0.840 | 0.893 | 0.947 | 1. | 1.053 | 1.107 | 2.480 | 2.542 | 2.604 | 2.666 | 2.728 | 2.790 | 2.852 | 2.914 | 2.976 | 3.038 | 3.100 | 6.199 | 12.937 | 11.642 | 11.550 | 3.705 | 4.017 | 4.687 | 1.506 |
| " " " | 2. | 2⅞ | 1.0192 | 8.497 | 0.747 | 0.797 | 0.848 | 0.899 | 0.949 | 1. | 1.051 | 2.354 | 2.413 | 2.471 | 2.530 | 2.589 | 2.648 | 2.707 | 2.766 | 2.825 | 2.883 | 2.942 | 5.884 | 12.279 | 11.051 | 10.964 | 3.516 | 3.813 | 4.449 | 1.430 |
| " " " | $2\frac{1}{10}$ | 3 | 1.0200 | 8.504 | 0.711 | 0.759 | 0.807 | 0.855 | 0.903 | 0.952 | 1. | 2.240 | 2.296 | 2.352 | 2.408 | 2.464 | 2.520 | 2.576 | 2.632 | 2.688 | 2.744 | 2.800 | 5.600 | 11.684 | 10.516 | 10.433 | 3.346 | 3.629 | 4.233 | 1.361 |
| Pounds Stock " | 40 | 45 | 1.420 | 11.839 | 0.317 | 0.339 | 0.360 | 0 382 | 0.403 | 0.425 | 0.446 | 1. | 1.025 | 1.050 | 1.075 | 1.100 | 1.125 | 1.150 | 1.175 | 1.200 | 1.225 | 1.250 | 2 500 | 5.217 | 4.695 | 4.658 | 1.494 | 1.620 | 1.890 | 0.608 |
| " " " | 41 | 46.2 | 1.434 | 11.956 | 0.310 | 0.331 | 0.351 | 0.372 | 0.393 | 0.414 | 0.436 | 0.976 | 1. | 1.024 | 1.049 | 1.073 | 1.098 | 1.122 | 1.146 | 1.171 | 1.195 | 1.220 | 2 439 | 5.089 | 4.580 | 4.544 | 1.458 | 1.580 | 1.844 | 0.593 |
| " " " | 42 | 47.4 | 1.447 | 12.064 | 0.302 | 0.323 | 0.343 | 0.360 | 0.384 | 0 405 | 0.425 | 0.952 | 0.976 | 1. | 1.024 | 1.048 | 1.071 | 1.095 | 1.119 | 1.143 | 1.167 | 1.190 | 2.381 | 4.968 | 4.471 | 4.437 | 1.423 | 1.543 | 1.800 | 0.579 |
| " " " | 43 | 48.6 | 1.461 | 12.181 | 0.295 | 0.315 | 0.335 | 0.355 | 0.375 | 0.395 | 0.415 | 0.930 | 0.953 | 0.977 | 1. | 1.023 | 1.046 | 1.070 | 1.093 | 1.116 | 1.140 | 1.163 | 2.326 | 4.853 | 4.367 | 4.333 | 1.390 | 1.507 | 1.758 | 0.565 |
| " " " | 44 | 49.8 | 1.474 | 12.289 | 0.289 | 0.308 | 0.327 | 0.347 | 0.367 | 0.386 | 0.406 | 0.909 | 0.932 | 0.955 | 0.977 | 1. | 1.023 | 1.045 | 1.068 | 1.091 | 1.116 | 1.136 | 2.273 | 4.742 | 4.268 | 4.234 | 1.358 | 1.473 | 1.718 | 0.552 |
| " " " | 45 | 51. | 1.488 | 12.406 | 0.282 | 0.301 | 0.320 | 0.339 | 0.358 | 0.377 | 0.297 | 0.889 | 0.911 | 0.933 | 0.956 | 0.978 | 1. | 1.022 | 1.044 | 1.067 | 1.089 | 1.111 | 2.222 | 4.637 | 4.173 | 4.140 | 1.328 | 1.440 | 1.680 | 0.540 |
| " " " | 46 | 52.2 | 1.504 | 12.539 | 0.276 | 0.295 | 0.313 | 0.332 | 0.351 | 0.369 | 0.388 | 0.870 | 0.891 | 0.915 | 0.935 | 0.957 | 0.978 | 1. | 1.021 | 1.043 | 1.065 | 1.087 | 2.174 | 4.536 | 4.083 | 4.050 | 1.299 | 1.409 | 1.643 | 0.528 |
| " " " | 47 | 53 4 | 1.519 | 12.664 | 0.270 | 0.288 | 0.307 | 0.325 | 0.343 | 0.362 | 0.380 | 0.851 | 0.872 | 0.894 | 0.915 | 0.936 | 0.957 | 0.979 | 1. | 1.021 | 1.043 | 1.064 | 2.128 | 4.440 | 3.996 | 3.964 | 1.271 | 1.379 | 1.609 | 0.517 |
| " " " | 48 | 54.6 | 1.535 | 12.798 | 0.264 | 0.282 | 0.300 | 0.318 | 0.336 | 0.354 | 0.372 | 0.833 | 0.854 | 0.875 | 0.896 | 0.917 | 0.938 | 0.958 | 0.979 | 1. | 1.021 | 1.042 | 2.083 | 4.347 | 3.912 | 3.882 | 1.245 | 1.350 | 1.575 | 0.506 |
| " " " | 49 | 55.8 | 1.550 | 12.923 | 0.259 | 0.277 | 0.294 | 0.312 | 0.329 | 0.347 | 0.364 | 0.816 | 0.837 | 0.857 | 0.878 | 0.898 | 0.918 | 0 939 | 0.959 | 0.980 | 1. | 1.020 | 2.041 | 4.258 | 3 833 | 3.802 | 1.220 | 1.322 | 1.543 | 0.496 |
| " " " | 50 | 57. | 1.566 | 13 056. | 0.254 | 0.271 | 0.288 | 0.305 | 0.323 | 0.340 | 0.357 | 0.800 | 0.820 | 0.840 | 0.860 | 0.880 | 0.900 | 0.920 | 0.940 | 0.960 | 0.980 | 1. | 2.000 | 4.173 | 3.756 | 3.735 | 1.195 | 1.296 | 1.512 | 0.486 |
| " Pure Zinc Chloride $= ZnCl_2$ | | | | | 0.127 | 0.136 | 0.144 | 0.153 | 0.161 | 0.170 | 0.179 | 0.400 | 0.410 | 0.420 | 0.430 | 0.440 | 0.450 | 0.460 | 0.470 | 0.480 | 0.490 | 0.500 | 1. | 2.087 | 1.878 | 1.867 | 0.598 | 0.648 | 0.756 | 0.243 |
| " " Metallic Zinc $= Zn$ | | | | | 0.061 | 0.065 | 0.069 | 0.073 | 0.077 | 0.081 | 0.086 | 0.192 | 0.197 | 0.201 | 0.206 | 0.211 | 0.216 | 0.220 | 0.225 | 0.230 | 0.235 | 0.240 | 0.479 | 1. | 0.900 | 0.893 | 0.286 | 0.311 | 0.362 | 0.116 |
| " Zinc Dross $= 90\%$ Zn | | | | | 0.068 | 0.072 | 0.077 | 0.081 | 0.086 | 0 090 | 0.095 | 0.213 | 0.218 | 0.223 | 0.229 | 0.234 | 0.240 | 0.245 | 0.250 | 0.256 | 0.261 | 0.266 | 0.532 | 1.111 | 1. | 0.992 | 0.318 | 0.345 | 0.403 | 0.129 |
| " Pure Hydrochloric Acid Gas $= HCl$ | | | | | 0.068 | 0.073 | 0.077 | 0.082 | 0.087 | 0.091 | 0.096 | 0.215 | 0.220 | 0.225 | 0.231 | 0.236 | 0.242 | 0.247 | 0.252 | 0.258 | 0.263 | 0.268 | 0.537 | 1.120 | 1.008 | 1. | 0.321 | 0.348 | 0.406 | 0.130 |
| " Commercial Muriatic Acid $= 32\%$ HCl | | | | | 0.212 | 0.227 | 0.241 | 0.256 | 0.270 | 0.284 | 0.299 | 0.669 | 0.686 | 0.703 | 0.720 | 0.736 | 0.753 | 0.770 | 0.786 | 0.803 | 0.820 | 0.837 | 1.673 | 3.492 | 3.142 | 3.118 | 1. | 1.084 | 1.265 | 0.407 |
| Number of Ties 6" x 8" x 8' | | | | | 0.196 | 0.209 | 0.222 | 0.236 | 0.249 | 0.262 | 0.276 | 0.617 | 0.633 | 0.648 | 0.664 | 0.679 | 0.694 | 0.710 | 0.725 | 0.741 | 0.758 | 0.772 | 1.543 | 3.220 | 2.898 | 2.875 | 0.922 | 1. | 1.167 | 0.375 |
| " " " 7" x 8" x 8' | | | | | 0.168 | 0.179 | 0.191 | 0.202 | 0.213 | 0.225 | 0.236 | 0.529 | 0.542 | 0.556 | 0.569 | 0.581 | 0.595 | 0.608 | 0.622 | 0.635 | 0.648 | 0.661 | 1.322 | 2.760 | 2.484 | 2.465 | 0.790 | 0.857 | 1. | 0.321 |
| Cubic Feet of Timber | | | | | 0.522 | 0.558 | 0.593 | 0.628 | 0.664 | 0.699 | 0.735 | 1.646 | 1.687 | 1.728 | 1.770 | 1.811 | 1.852 | 1.893 | 1.934 | 1.975 | 2.016 | 2.058 | 4.115 | 8.587 | 7.728 | 7.667 | 2.459 | 2⅔ | 3⅓ | 1. |

| Pure Solid | Formula, | Molecular Weight, | Normal Factor, | Sp. Grav., | Melting P't, | Sublimes at | Solubility in Water. | | Solubility in Alcohol, |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | At 15° C = 3 in 1. | At 100° C in all Proportions. | |
| Chloride of Zinc. | $ZnCl_2$. | 135.84. | 0.06792. | 2.758. | 400° C. | Red Heat. | | | 1 in 1. |

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If crystallized, fused, or granular, it must contain not less than 97% of re zinc chloride.

If in solution, it must contain about 45% of pure zinc chloride, not ore than 2% of other salts, and the rest water; it must contain no free ids.

If the zinc chloride as received is found to contain free acid, slab zinc ould be immersed in it and allowed to remain until a piece of polished nc, free from grease, shows no action after immersion for twelve hours.

The presence of free acid of any kind in zinc chloride may be easily tected by diluting the salt to about the strength to be used, say 2%, d adding to 100 c.c., a drop of a $\frac{1}{1000}$ solution of methyl orange. In e presence of free acid this gives a pink indication, but the chloride is utral to the indicator.

The strong solution of zinc chloride as furnished by the manufacturer known as "stock solution of zinc chloride." It contains about 45% of nc chloride and more or less of chlorides of other bases, some sulphate zinc, and some oxide of zinc. The solid chloride of zinc is sold under rious names, such as "fused" and "granular." It is the same stock lution evaporated down and melted. It is then broken up and packed thin iron drums for shipment. It usually contains the same impuri-s as the stock. After dilution for use the solution is called "standard lution." The accompanying table has been found almost indispensable the author in the operation of large burnettizing plants.

In this table, and opposite each item in the first column, will be found unit; above and below this are the equivalent parts of all other items the first column. Many check experiments have been made to verify is table.

*Example.*—How many pounds of stock solution 46% zinc chloride will required to burnettize 50,000 cu. ft. of timber?

Opposite "cubic feet of timber" in the lower right-hand corner of the ble, will be found the figure 1; above this, in the line opposite Pounds stock 46% zinc chloride," will be found 0.528; this is the nount of such stock required for one cubic foot of timber; hence,

$$0.528 \times 50{,}000 = 26{,}400 \text{ lbs. required.}$$

*Example.*—On hand 10,000 lbs. of metallic zinc. How many pounds 32% commercial muriatic acid will be required to convert all the zinc to chloride? How many pounds of 45% stock solution will result? ow many gallons of $1\frac{7}{10}$% standard solution can be made therefrom? nd how many 6″x 8″x 8′ ties can be treated therewith?

Follow the horizontal line opposite metallic zinc until 1 is found; ove and below this, in the same vertical column, and on the same rizontal line as the item sought, will be found the proper multiplier r each case. Thus:

| | |
|---|---|
| Commercial muriatic acid required | $3.492 \times 10{,}000 = 34{,}920$ lbs. |
| 45% stock solution obtained | $4.637 \times 10{,}000 = 46{,}370$ lbs. |
| $1\frac{7}{10}$% standard solution obtained | $14.481 \times 10{,}000 = 144{,}810$ gals. |
| 6″ x 8″ x 8′ ties treated | $3.220 \times 10{,}000 = 32{,}200$. |

## CREOSOTING.

This process consists in injecting hot creosote, or dead oil of coal tar, to timber with pressure, the timber having been previously dried by ppropriate methods.

This process was invented by John Bethell, in England, about the year 1838. It was introduced into the United States in 1854. Its use has constantly increased since, and it is now an important industry. In the Eastern States there are many large plants for the treatment of timber with creosote. Among these the most extensive and best known are: That of the Lehigh Valley Railroad, at Perth Amboy, N. J.; of Eppinger & Russell, at Long Island City, N. J.; of the Atchison, Topeka & Santa Fe Railroad, at Las Vegas, N. M.

On this coast the Southern Pacific Company has two plants in which this process is worked.

An essential condition for success with this process is a *suitable creosote properly applied.*

In the manufacture of ordinary illuminating gas, by the destructive distillation of bituminous coal, the following are produced: Illuminating gas, ammoniacal liquor, coke, and coal tar. Of these the last is further distilled into naphthas, pitch, and heavy or dead oils. This last is the creosote (so called) used in timber preservation. It is unfortunate that this substance should be known commercially as creosote, since it really contains only a very minute percentage of true creosote, such as is used in dentistry. The name creosote seems to have been given it from its similarity in smell to true creosote. As, however, it is universally known by this name, it will be so called in the rest of this article.

The principal necessary ingredients of a good creosote for timber preservation are: About 8% of tar acids or phenols-carbolic and cresylic acids; about 20% of naphthalene; about 30% of heavy residuum after distillation up to 600° F., consisting principally of anthracene and pitch. The remainder, light and heavy oils, principally of use as solvents for the necessary ingredients.

Creosote should contain no ammonia or water. It should be completely liquid at 100° F., in order to enable it to be easily handled by pumping, and in cooling should show little or no deposit above 90° F. It should contain no ingredients soluble in water.

At one time much stress was laid upon the toxic effect of certain alkaloids present in coal tar creosote; these are acridine and cryptidine, but their beneficial effect has not been demonstrated.

It appears to be a fact that only a creosote constituted as above will insure satisfactory results, and as these qualities, in such combination, are found only in the dead oil of coal tar, it is customary to specify that the creosote must be the product of bituminous coal tar only. This excludes creosote made from wood tar or from petroleum tar.

The timber to be treated is first dried in retorts by steam applied either directly or to a bath of creosote in which the timber is immersed. When thoroughly dried, creosote is injected by pressure.

During this process the timber is first thoroughly sterilized and desiccated by heat, and immediately afterward sealed externally by creosote. All albuminous ingredients of the sap are coagulated by heat and the liquid or volatile tar acids and naphthalene. All germs are destroyed and an external protection afforded through which fresh germs cannot penetrate. The superficial coat of heavier material affords efficient protection against external attack by the teredo, limnoria, etc.

During injection a mechanical separation of the creosote takes place to some extent. The lighter and more fluid tar acids and naphthalene penetrate farthest, while the heavier portions, mostly the residuum above

erred to, remain near the surface by filtration. Good practice uires that there should be sufficient "black" penetration to prevent being torn away, in the ordinary handling and shipment necessary, timber hooks, etc. For piles this requires not less than 10 lbs. of osote per cubic foot of timber, and for smaller timber proportionately re, so as to give the same superficial penetration. For important k it is better to allow 14 lbs. per cubic foot to insure success. But so g as there is a sufficient external coat to insure protection to the erior there seems to be no object in applying more.

The increased demand for the heavier portions of creosote in the nufacture of artificial madder and for roofing pitch renders it diffi- t to obtain cheaply creosote having a sufficiency of residuum. This led the author to make some experiments on mixing with a lighter osote, a proper portion of asphalt, so as to supply the necessary vy constituents. The asphalt used for this purpose should be nearly id at ordinary temperature, but not hard or brittle. When such halt and creosote are heated and stirred together, an intimate mix- e results. This does not separate on cooling, and the resulting com- nd acts, as far as yet ascertained, in all respects as ordinary creosote, ept that it is more fluid than either the original creosote or the ginal asphalt at the same temperature. Apparently a chemical com- ation of some kind takes place, changing somewhat the physical perties of the original ingredients. But our experience with this xture is not yet sufficiently extended to warrant its recommendation general use.

The net cost of creosoting in San Francisco with a properly designed nt, and at current rates for labor and material, for injecting 10 lbs. creosote per cubic foot, is about $20 per 1,000′ B.M. The creosote ts about 13 cents per gallon in San Francisco. It is manufactured a large scale in the Eastern States, in England, and to some extent this coast.

## IN GENERAL.

It is not to be supposed that any mode of timber preservation now known l, under all circumstances, prolong the life of timber indefinitely. It y be relied upon that *burnettizing* will extend the life of timber to least double that which it would have if untreated, and that *creosoting* perly done will preserve timber, under the most unfavorable circum- nces, for at least twenty-five years. These conclusions are the results a great many observations and records.

In the matter of wood preservation the following axioms may be arded as well established:

No process can be considered as generally effective which affords erficial protection only; such treatment may defend timber against ternal attack, but it provides no protection against internal decay.

Unless preservative treatment is properly done, using proper materials, is a waste of time and of money. As a corollary to this, no material ould be used for wood preservation until its suitability has been termined by analysis, and no finished product accepted until after rough inspection.

# RESUME OF ORIGINAL RESEARCHES, ANALYSES, AND REFININ METHODS OF PETROLEUM, MAINLY FROM THE SOUTHERN COUNTIES OF CALIFORNIA.

By Frederick Salathè, Ph.D.

## ORIGIN.

The opinions on the origin of petroleum still differ widely amon chemists, but through the classic researches recently made by Engle who has produced the complete series of paraffins, identical with th petroleum-hydrocarbons, by synthesis from fish oils under pressure durin distillation, the theory of animal origin of petroleum has become mos plausible.

The question has been asked, what has become of the nitrogen, petroleum was formed of marine animals, and why are most of th petroleum-hydrocarbons free from nitrogen combinations?

Analysis of some natural gas from a well in Pennsylvania shows th presence of nitrogen in natural gas, which in one instance amounted t 23% by volume.

In 1892, I began an investigation on the hydrocarbon series const tuting the Ventura County crude oils, which I found to contai invariably from 0.75% to 3.5% of nitrogen. The experiments were cor ducted in such a manner as to ascertain in what form or combinatio the nitrogen existed in the crude petroleum, with the view of isolatin the nitrogenous hydrocarbons.

The result was the identification of a number of organic bases of th Pyridin and Chinolin series, which heretofore were only found in th so-called animal tar from the distillation of animal cadavers or bone

The presence of these organic bases in the California petroleum indi cates, therefore, clearly the origin of this petroleum from animal matte furnished by the slow decay of a marine fauna, which became extinc by changes of the sea-water through local influx of saline mothe liquors.*

## ELEMENTARY ANALYSIS.

The sample of crude petroleum represented an average mixture Ventura County crude oils of 23.5° B., or 0.9120 specific gravity.

| | |
|---|---|
| Carbon | 84.0% |
| Hydrogen | 12.7 |
| Nitrogen | 1.7 |
| Oxygen | 1.2 |
| Sulphur | 0.4 |
| | 100.0% |

*Theory advanced by Oechoener, Engler, Zalociecke. More detailed reference will b found in a paper on the origin of petroleum, read by writer, April, 1894, before the Tech nical Society of the Pacific Coast.

## CHEMICAL CONSTITUTION AND HYDROCARBON SERIES OF VENTURA AND LOS ANGELES COUNTIES CRUDE OILS.

These crude oils, which all carry asphalt, held in combination with the gh boiling members of the hydrocarbon series, are of a very complex nstitution, which makes their refining exceedingly difficult. By a ries of chemical reactions and fractional distillations, I have succeeded isolating various hydrocarbons, which define clearly the presence of e following hydrocarbon series:

(*a*) Hydrocarbons of the Paraffin, or fatty, series. $C_nH_{2n+2}$.

(*b*) Hydrides or Hydron addition-products of the Benzole series. $H_{12}$ and homologous hydrocarbons.

(*c*) Pyridin and Chinolin series. $C_nH_{2n-5}N$ and $C_nH_{2n-1}N$.

(*d*) Isomeres of the Terpene series. $C_nH_{2n-4}$.

(*a*) *Hydrocarbons of the Paraffin series*, $C_nH_{2n+2}$. These were sepated by successive treatment of crude oil and its fractions with fuming ulphuric acid containing 20% sulphuric anhydride in solution, nitric id 43° B., chromic acid, potassium-hydrate, followed by fractional disllations. Owing to the great difficulty of isolating the high boiling embers, whose boiling-points are very close together, I examined the action boiling between 80° and 100° C., and isolated and identified in ie same *Heptane*, $C_7H_{16}$ of 97° C. boiling-point. By chlorination and ubsequent decomposition of the chlorides, Heptylic alcohol was formed. rystallizable paraffin could not be detected in any of the heavy fracons. At 20° C. a slight cloudiness appeared in the oils, caused by the resence of traces of colloidal paraffin, such as constitutes the liquid araffins in Eastern oils.

(*b*) *Hydrides of the aromatic or Benzole series*, $C_nH_{3n-6}$. These hydrarbons could only be separated and identified from the residue obtained y the treatment of the original oil with fuming sulphuric acid, and ere in form of sulpho-conjugated derivatives of the Benzole series, ielding, when melted with caustic potassa, Phenol and its homologous xy-products, which I have under further investigation.

The great facility with which California oils produce, by pyrogenic ction, Benzole and its homologues, which process the writer has specially studied, further illustrates the presence of hydrides of the romatic series.

(*c*) *Pyridin and Chinolin series*, $C_nH_{2n-}$ and $C_nH_{2n-11}N$. I obtained nd isolated this group of basic hydrocarbons by extraction of the Caliornia crude oil and its fractions with dilute sulphuric acid, 1:5, at 212° F. The acid solution containing the organic bases in the form of sulhates was then steamed until no more volatile oils, mainly Pyrrol, assed over with the aqueous vapors. The bases were then precipitated y potassium hydrate in form of yellowish-gray flocks, which, by proonged heating on the waterbath, formed a supernatant oil of a reddishrown color and of the characteristic penetrating odor of the Pyridin ases. The crude basic oils showed a specific gravity of 0.9985. By noderate oxidation with permanganate of potassium the basic hydrides were first converted into normal bases, while at the same time the ormation of small quantities of $\alpha$ Pyridin-monocarbonic acid was

observed derived from partial oxidation of the homologous bases
Pyridin. The resulting bases were then dried over potassium hydra
and submitted to fractional distillations in the following fractions:

| | | | | | |
|---|---|---|---|---|---|
| From | 115° | to 121° C., | specific | gravity | = 0.9580 |
| " | 132° | " 138° C., | " | " | = 0.9610 |
| " | 137° | " 170° C., | " | " | = 0.9735 |
| " | 169° | " 180° C., | " | " | = 0.9890 |
| " | 179° | " 200° C., | " | " | = 1.0500 |
| " | 199° | " 250° C., | " | " | = 1.0860 |
| " | 249° | " 320° C., | " | " | = 1.1200 |

From fraction 115° to 121° C. pure Pyridin was isolated, by formin
the insoluble Ferro-cyanide and the Platino-chloride combination.
distilled at the constant temperature of 116° C.

The next homologous base, the $\alpha$ Picolin or $\alpha$ Methyl-pyridin, w
isolated from fraction 132° to 138° by converting the same into t
Picolin-ferrocyanide combination, which is easily soluble in water, an
which by double decomposition with alkali yielded $\alpha$ Picolin of 14
boiling-point.

The Pyridin and $\alpha$ Picolin showed all the characteristics of the
bases made from animal tar. The higher homologous bases, such
Lutidin, Collidin, etc., have not yet been isolated by me except th
their presence is indicated by the uniform rise in the boiling-points
fractions. In continuing the distillation above 300° C. considerab
ammonia-gas is generated, which is formed by the action of the hig
temperature on the heavier basic products. All fractions above 200°
possess a remarkable, fine crimson fluorescence. By carrying the di
tillation to 360° C., a glossy, hard, asphalt-like substance remains in t
still; diluted sulphuric acid, 1:5, dissolves the same to the greatest pa
and alkalies precipitate from the filtered solution a crystalline powd
which probably contains a number of unknown solid nitrogenou
hydrocarbons of the Pyridin or Chinolin series, parallel with Anthr
cene, Phenanthrene, Chrysene, etc., from coal tar.

The presence of Chinolin and its homologues was demonstrated b
the Cyanin reaction, a blue color, which is formed from the Iodin deriv
tives of Chinolin and its homologues.

The occurrence of Pyridin and Chinolin bases in California crude oi
opens up a new resource for these products, which are largely used f
the synthetical production of alkaloids, dyes, etc., and in a large measu
for 'denaturalizing' alcohol in Europe.

(*d*) *Isomeric Hydrocarbons of the Terpene series;* $C_nH_{2n-4}$. The
hydrocarbons enter easily into polymerization and thus form the grea
est part of the asphaltic constituents usually termed Petrolene ar
Asphaltene, which terms I use instead of Retinoid and Retene; the fo
mer being a series of polymerized hydrocarbons, the latter their oxid
tion product.

The investigation on these hydrocarbons is not far enough advanc
for publication.

(*e*) *Sulphureted Hydrocarbons.* These of the California crude oi
differ in their chemical constitution from the sulphureted Trenton lim
oils of Ohio or Canada, mainly in that the sulphur is for the greate
part only confined by chemical substitution to the highest boiling co

ituents, the asphalt, and is practically transferred by chemical action *the middle fractions during distillation* in the form of sulphur-addition roducts, another part escaping in the form of sulphureted hydrogen. Distillation over soda lime or passing the vapors over the same completely eliminates the sulphur from the hydrocarbons; this is not the ase with Ohio or Canada oils.

RACTICAL DISTILLATIONS AND YIELDS OF VARIOUS SOUTHERN CALIFORNIA CRUDE OILS.

1. *Sespe oil*, of 25.2° B. or 0.9022 specific gravity at 60° F.

| | |
|---|---|
| Naphtha, 60° B. at 150° C. | 7.30% |
| Illuminating distillate, 42° B. at 330° C. | 19.50 |
| Gas distillate, 28° B.–above 360° C. | 25.00 |
| Lubricating distillate, 24° B.–above 360° C. | 35.80 |
| *Asphalt and Loss | 12.40 |
| | 100.00% |

The Pyridin bases equal 2.30%

2. *Crude Oil from Four Forks*, of 24° B. or 0.9090 specific gravity.

| | |
|---|---|
| Naphtha | 6.00% |
| Illuminating distillate | 17.10 |
| Gas distillate | 29.50 |
| Lubricating distillate | 34.40 |
| Asphalt and Loss | 13.00 |
| | 100.00% |

The Pyridin bases equal 1.75%.

3. *Crude Oil from Torrey Cañon*, of 27° B. or 0.8917 specific gravity.

| | |
|---|---|
| Naphtha | 9.20% |
| Illuminating distillate | 21.50 |
| Gas distillate | 26.00 |
| Lubricating distillate | 30.30 |
| Asphalt and Loss | 13.00 |
| | 100.00% |

The Pyridin bases equal 1.52%.

4. *Crude Oil from Lime Kiln Cañon* (Eureka Oil Co.), of 29° B. or .8805 specific gravity.

| | |
|---|---|
| Naphtha | 14.10% |
| Illuminating distillate | 26.40 |
| Gas distillate | 24.00 |
| Lubricating distillate | 27.00 |
| Asphalt and Loss | 8.50 |
| | 100.00% |

The Pyridin bases equal 1.44%.

5. *Crude Oil from Adams' Cañon* (Tunnel Oil), greenish oil of 24° B. r 0.9090 specific gravity.

| | |
|---|---|
| Naphtha | 5.20% |
| Illuminating distillate | 24.50 |
| Gas distillate | 17.30 |
| Lubricating distillate | 46.00 |
| Asphalt and Loss | 7.00 |
| | 100.00% |

The Pyridin bases equal 0.88%.

*The gravities of the products, Naphtha, etc., are the same in all the following analyses f crude oils, as in No. 1, Sespe oil.

6. *Crude Oil from Los Angeles Wells*, of 14.2° B. or 0.9708 specifi gravity.

| | | |
|---|---|---|
| Naphtha | Traces. | |
| Illuminating distillate | 6.00% | |
| Gas distillate | 17.50 | |
| Lubricating distillate | 51.50 | |
| Asphalt and Loss | 25.00 | |
| | | 100.00% |

The Pyridin bases equal 3.2%.

This crude oil contains usually from 2.5% to 7% of water and 0.16% t 2% of suspended mineral matter, mainly a fine silicious clay.

7. *Fresno County Crude Oil, from Coalinga*, of 54° B. or 0.7608 specifi gravity.

This oil represents a distillate made by nature, nearly all fractior having a very low fire test.

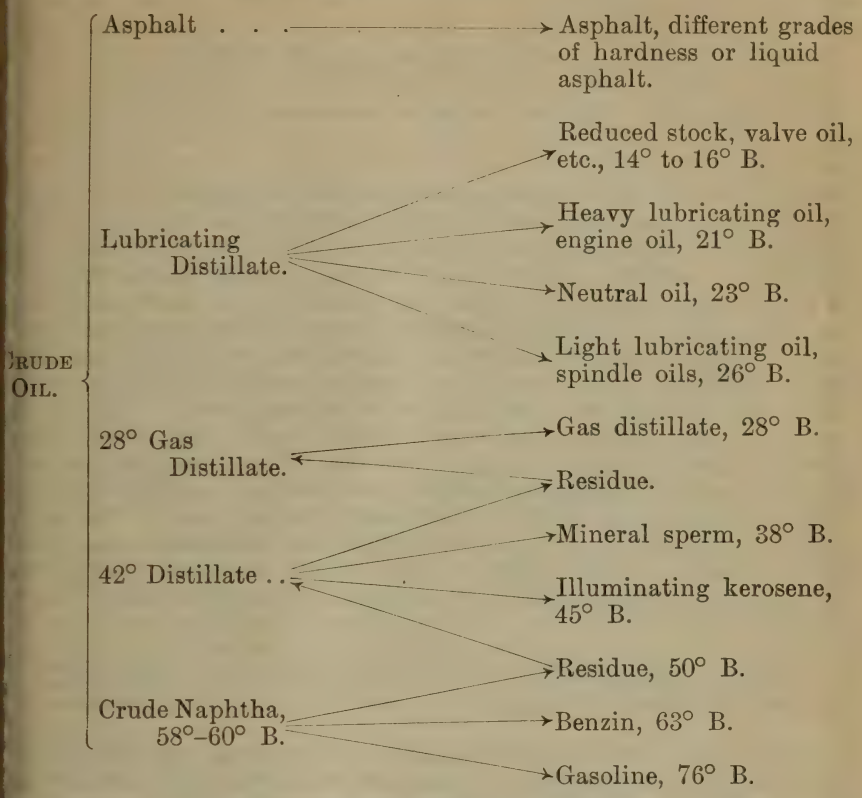
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fraction | 1. | 10%, | at temperature from | 49° | to | 111° | C. |
| " | 2. | 10%, | " " " | 110° | " | 121° | C. |
| " | 3. | 10%, | " " " | 120° | " | 141° | C. |
| " | 4. | 10%, | " " " | 140° | " | 161° | C. |
| " | 5. | 10%, | " " " | 160° | " | 176° | C. |
| " | 6. | 10%, | " " " | 175° | " | 196° | C. |
| " | 7. | 10%, | " " " | 195° | " | 227° | C. |
| " | 8. | 10%, | " " " | 226° | " | 249° | C. |
| " | 9. | 10%, | " " " | 248° | " | 275° | C. |
| " | 10. | 10%, | Residue is hard asphalt. | | | | |

## REFINING.

From the investigations given so far it is evident that the refining the crude California oils is not an easy task and that they require refi ing methods different from those practiced with Eastern or Russian oil

The complicated nature of this class of asphaltic crude oils necessitat complete elimination of all unstable hydrocarbons by inexpensive pra tical processes. Another great difference exists between the specif gravities of Eastern oil distillates and those of California oils. Viscosit of distillate or reduced stock being equal, the gravities are from 5° to 6 B. lower in California oil fractions than in those of Eastern oils. Flas and fire tests are from 10° to 30° F. lower in California oil distillat than in Eastern distillates of the same gravity.

The following is a diagram of products available from California crude il by refining, showing where redistillation is required:


Asphalt . . .
Asphalt, different grades of hardness or liquid asphalt.
Reduced stock, valve oil, etc., 14° to 16° B.
Lubricating Distillate.
Heavy lubricating oil, engine oil, 21° B.
Neutral oil, 23° B.
Light lubricating oil, spindle oils, 26° B.
RUDE OIL.
28° Gas Distillate.
Gas distillate, 28° B.
Residue.
Mineral sperm, 38° B.
42° Distillate . .
Illuminating kerosene, 45° B.
Residue, 50° B.
Crude Naphtha, 58°–60° B.
Benzin, 63° B.
Gasoline, 76° B.

The average yield of products from 100 bbls. of Ventura County ixed crude oil of 24° B., determined by actual running on a large cale, is as follows:

| | |
|---|---|
| Gasoline, 76° B. | 3 bbls. |
| Benzin, 63° B. | 4 " |
| Kerosene, 45° B. | 15 " |
| Heavy kerosene, 38° to 40° B. | 8 " |
| Gas distillate, 28° B. | 21 " |
| Light lubricating (spindle) oil, 26° B. | 10 " |
| Neutral oil, 23° B. | 12 " |
| Heavy neutral oil, 21° B. | 6 " |
| Reduced stock, lubricating oil, 14° B. | 5 " |
| Asphalt, crude | 11 " |
| Loss | 5 " |

The extraction of Pyridin bases with dilute sulphuric acid should be one before the redistillation of the distillates, as the treatment of those istillates with concentrated sulphuric acid will otherwise form certain ulpho-conjugated products which, during the washing process with ater and alkali, decompose and re-enter into solution again with the efined products.

The special refining methods will be discussed in the next paper, as ertain processes are not yet covered by letters patent.

# OIL AS FUEL IN LOS ANGELES COUNTY.

By W. L. Watts, Field Assistant.

Oil is largely used for fuel on the Southern California Railroad, portion of the Santa Fe system, between Barstow and San Diego. Mor than half of their locomotives are now adapted to the use of oil as fue The burners used were invented by W. Booth, formerly Master Mechani of the Central Railroad, of Piru; the Santa Fe Co. has made som improvements in the original design. Experiments, extending over period of six months, demonstrated the superiority of oil as compare with solid fuel. An average of the results obtained show that 4 bbl of oil did the same work as 2,200 lbs. of Nanaimo coal. Experiment extending over sixteen days, with a freight engine, 19″x 28″ cylinder gave an average evaporation of 13.11 lbs. of water to each pound coal consumed. Taking coal at $6 65 per 2,000 lbs., and oil at $1 33 p bbl., a money saving of 27.1% is effected. The oil used in this exper ment was supplied by the Union Oil Co., and its specific gravity wa 23° B. During January, 1896, oil was used as fuel on 25 locomotive being equally divided between passenger and freight service. The r sults showed:

| | |
|---|---|
| Oil consumed by these 25 locomotives during January | 2.077 tons. |
| Distance traveled | 87.063 miles. |
| Average cost per mile | 14.39 cents. |

The gravity of the oil used was 15° B. During same period coal w used as fuel on 25 locomotives; they performed practically similar wo to the engines fired by oil. Average cost per mile, 23.20 cents, or pra tically a money saving of 37.975% in favor of oil.

During January, 1896, the cost of coal was $6 60 per 2,000 lbs.; the same date the cost of oil was $6 03 per 2,000 lbs.

During December, 1895, an overland passenger engine, cylinde 19″x 26″, ran 7,347 miles and consumed 143.2 tons of oil. A simil service with coal required 294 tons. Taking oil and coal at the abo figures, the relative values are: Cost of oil, $863 50, or 11.75 cents per mil cost of coal, $1,940 40, or 26.41 cents per mile; practically a money savi of 55.5%. The average of other experiments made, with oil as fuel, w 14.24 cents per mile. In these experiments steam from the boiler was us to atomize the oil and the oil is heated by a steam-coil to a temperatu of 100° to 120° F. Two 4″ flat-mouthed burners are used to each engi The fire-box is protected with fire-bricks and there is an arch of fi brick at the back of the flues, similar to that in coal-burning locom tives. The Los Angeles Consolidated Electric Railway Co. made series of careful experiments to test the value of Puente oil as compar with Wellington coal. The results of tests on runs, which averaged hours per day for ten days, showed that 19.41 tons of Wellington c had a fuel value equal to that of 2,957 gals. of oil of 24° B. The u of oil also saved the labor of five men at $2 a day each. In two of t

ower-houses the Wilgus steam burner is used and in one the Gilbert & arker aërated burner. It is said that these burners give practically ie same results. Oil is used as fuel in the rolling-mills of the Los ngeles Steel and Iron Co., the Crawford and the Wilgus burners being mployed, in which the oil is atomized by steam. The superintendent f this company states that it requires about $1\frac{2}{3}$ bbls. of oil to manufac- ire a long ton of muck bar from scrap iron, and about the same amount f oil to manufacture the muck bar into finished sheet-iron. Thus it takes bout $3\frac{1}{3}$ bbls. of oil to manufacture one ton of finished sheet-iron from crap. He also states that, for steam purposes, 3 bbls. of oil equal ,000 lbs. of good bituminous coal, and that for the heating furnaces, $\frac{1}{2}$ bbls. of oil equal 2,000 lbs. of bituminous coal; thus, taking coal at 6 65 per ton of 2,000 lbs. and oil at $1 per bbl., the use of oil instead f coal at these works effects a saving, in round figures, of 54.6% for eam purposes, and 62.5% for the heating furnaces.

The court-house at Los Angeles is heated by steam furnished by two oilers at 75 H.P. estimated capacity. Crude oil of 22° to 26° B. is used ı Gilbert & Barker's aërated burners for fuel. In these burners the oil atomized by air. The engineer states that when the boilers are run- ing at their full capacity, 1 gal. of oil will evaporate 15 gals. of water; *e.*, practically 1 lb. of oil will evaporate 15 lbs. of water; also, that lb. of good coal would evaporate about 8 lbs. of water in these boilers.

The Los Angeles Pressed Brick and Terra Cotta Co. have five kilns hose capacities range from 20,000 to 40,000 bricks. They use oil as iel. The manager states that they have tried both steam and air burn- rs, and have concluded that the air burner is the best, on account of its ıtroducing less moisture into the kiln; that, estimating good bitumi- ous coal at $8 per ton, and oil of 30° B. at $1 40 per bbl., the use of oil ffects a saving of about 15% in the fuel, and also the labor of one man ) each kiln.

At the California Sewer-Pipe Works at Vernon there are three 20′ and wo 28′ down-shaft kilns. DeBow steam burners are used. The mana- er states that the work done with $85 worth of coal, at $7 75 per ton, an be done with $30 worth of oil at 60 cents per barrel. Oil is being sed as fuel for open brick kilns by several of the brick manufacturers at os Angeles. It is said that 1 bbl. of oil is sufficient to burn 1,000 rick, and is therefore equal to $\frac{1}{4}$ cord of good wood. The price of wood $6 a cord.

From the foregoing, the relative fuel values of coal and oil are:

| | |
|---|---|
| L. A. S. & I. Co., heating furnaces | 1 ton Wellington coal equals 2.50 bbls. oil. |
| L. A. S. & I. Co., steam purposes | 1 ton Wellington coal equals 3.00 bbls. oil. |
| L. A. Con. Electric Railway Co. | 1 ton Wellington coal equals 3.62 bbls. oil. |
| L. A. Court-house, steam purposes | 1 ton good coal equals 3.10 bbls. oil. |
| So. Cal. R. R. Co. | 1 ton Nanaimo coal equals 4.00 bbls. oil. |

Those who have experimented with oils of different specific gravity tate that they find very little difference in the actual fuel value of the il tested, but that oils of a high specific gravity require to be heated in rder that they may pass freely through the feed pipes and be readily tomized.

In 1895 there was a prevailing opinion that the oils of high specific ravity had a much less fuel value than the oils of low specific gravity. o determine this point, experiments were conducted in the laboratory f the California State Mining Bureau. Samples of oil varying from

13° B. to 34° B. were burned in oxygen beneath a calorimeter, whic had been calibrated with hydrogen, as described in Bulletin No. 3. Th samples of heavy oil were cut with gasoline and the calorific value of th gasoline was deducted. The results showed a range of from 9,999 t 10,381 kilo-calories for the samples of oil tested. This was sufficient t demonstrate that there was no great difference in the relative calorif value of the samples tested; but limitations as to time prevented a su ficient number of experiments being made to work out the relative fu values for the different specific gravities. The samples tested wer practically freed from water and other extraneous matter.

It is interesting to note how the theoretical compares with the pra tical. Taking anthracite coal as a standard, 1 ton of which equivalent to 8,092 kilo-calories (available heat units) per kilogramm comparative working tests have shown that an average sample Nanaimo coal has an available fuel value of 6,684 kilo-calories pe kilogramme. Calorimetric tests made in the laboratory of the Califo nia State Mining Bureau showed that a sample of Los Angeles oil 0.973 sp. gr. (equal to 13° B.) had an available fuel value of 10,203 kil calories per kilogramme. Practical work on the Southern Californi Railroad showed that 4 bbls. of petroleum, 15° B. (or 1,352 lbs.), hav a fuel value of $1\frac{1}{10}$ tons of Nanaimo coal. As $1\frac{1}{10}$ tons of Nanaimo co are equivalent to 6,683,332 kilo-calories, therefore 1 ton of petroleum 15° B. (2,000 lbs.) has a working equivalent of 9,886,585 kilo-calorie

RELATIVE FUEL VALUE.

| | Available "Heat Units" in One Kilogramme. | Available "He Units" in On Ton, calculate as 909 Kilo-grammes. |
|---|---|---|
| Nanaimo coal | 6,684 | 6,075,756 |
| Sample of Los Angeles oil, 13° B., calorimetric test in laboratory of California State Mining Bureau | 10,203 | 9,274,527 |
| Sample of petroleum, 15° B., from practical working test on Southern California Railroad, as compared with Nanaimo coal | | 9,886,585 |

From the foregoing the following ratios of fuel value have been cor puted: 1 lb. of oil, per Mining Bureau tests, is equivalent to 1.526 lb of Nanaimo coal; 1 lb. of oil, per Southern California Railroad Co tests, is equivalent to 1.629 lbs. of Nanaimo coal.

In a furnace a more complete combustion can be secured with petr leum than it is possible to obtain with coal. Therefore, it is not su prising to find that practical work on the Southern California Railro gave a somewhat higher fuel value to the petroleum than did the calo metric tests in the laboratory. Moreover, the samples of petroleu used in the laboratory and on the railroad were dissimilar.

# RE-DEPOSITS WITH ESPECIAL REFERENCE TO THE MOTHER LODE.

By Harold W. Fairbanks, Ph.D.

Mining has been one of the occupations of man since the dawn of istory. As the primitive civilization arose out of the preëxisting con- ition of savagery, man with his surplus energy and growing esthetic astes, as well as because of the necessities of exchange, directed his ttention toward obtaining the precious metals which accident first led im to discover. Gold has always been considered one of the most aluable of the metals, partly from its beauty and partly from its rarity, nd men have been willing to risk life itself in efforts to obtain it.

For ages mining was carried on in the most crude fashion, and it is nly within the last quarter of a century that it has been reduced to nything like a science. The old search for a touchstone which could urn everything into gold has been given up, and men have been content o search laboriously for the precious metals, and undertake long courses f experimentation in an endeavor to find the best method to separate hem from the gangue and baser metals. Every year witnesses an ncrease in knowledge and an improvement in methods. The perfection lestined to be attained is probably hardly within our comprehension at he present time.

Before taking up a description of the Mother Lode, which will form he main subject of the paper, I wish to say a few words about ore- leposits in general and the conditions governing their formation. As he surface of the globe cooled down from its molten state the various lements assumed positions corresponding to their densities. As we go lownward the material of the earth grows more and more dense and ontains successively a greater and greater proportion of the metallic lements. This is evident from the fact that the average density of the arth is much greater than that of the surface rocks.

Through the long geological ages the globe has been subject to inces- ant disturbances with the repeated elevation and depression of vast reas and the erosion and transportation, by the means of atmospheric gencies, of the rocks of the mountains from their elevated positions to he beds of the seas. The surface of the earth is never permanently at est, and its constituents are constantly undergoing rearrangement in an ver changing manner.

Mountain ranges have always constituted lines of weakness and frac- ure, and along their axes great bodies of molten rock have been squeezed p from the heated interior, frequently flowing out over the surface and onsolidating as lava. Following each period of disturbance and erup- ion in different mountain regions where ore-deposits have been formed n abundance of springs of hot waters have appeared. These hot waters, which are ever circulating through the deeper-seated portions of the rust and dissolving out various components of the rocks, percolated

upward along the fissures followed by the earlier eruptive rocks, or alon simple fractures of the earth's crust, and finally deposited their content in the form which we call veins.

Gold, in common with many of the other minerals, is disseminated i exceedingly small quantities in nearly all rocks of the globe. It is on of the elements in solution in sea water, and with sufficiently refine laboratory apparatus its presence can be detected nearly everywhere The hot circulating waters play a part in concentrating the gold fron the rocks and collecting it in the veins, which might be compared to tha of the concentrators in a well-appointed quartz mill which separate th sulphurets from the gangue.

The waters which seep through the rocks reach a depth of severa miles, and becoming heated, are thus enabled to dissolve many of th rock constituents and transport them in solution. This we can readil see by the deposits about so many of the numerous mineral springs o California. It is a well-known fact that the solvent power of hot wate is much greater than that of cold, and with such minerals as the alka lies already in solution, its power of transformation of the rocks throug which it passes is very great. As the heated currents of water becom cooler toward the surface, many of the substances held in solution ar precipitated along the open spaces in the fissures.

Much speculation has been indulged in concerning the origin of th gold found in veins and how it was placed there, and many curiou views have been advanced. An examination of regions where the depo sition of minerals is still going on will help us greatly in understandin this question. At Sulphur Creek, in Colusa County, are located som hot springs, in the orifices of which the deposition of gold and quick silver is taking place at the present time. The openings which hav been made there in the course of mining are frequently so hot that it i almost impossible to work in them.

The Comstock mines offer, perhaps, one of the best illustrations o the manner in which gold and silver deposits are formed. Here is local area in which there has been a succession of igneous rocks throug a long period of time. Their formation was accompanied and followe by faulting; that is, fracturing and movement of adjoining portions o the earth's crust. During these movements the rocks were broken an partly ground up, with the formation of more or less open spaces betwee the fragments. Floods of hot water from deep-seated regions followe the formation of the fissures, and little by little the hot water remove the broken rock and substituted the quartz, sulphides, and precious metals. In order to make room for the enormous ore-bodies which wer found here, we must believe that the rock of the walls adjoining th fissures was gradually removed. The view is held by some geologist that the fissures were open and empty before the ore deposition begar being due to the movements of the irregular walls bringing hollows an protuberances opposite each other. However, in most cases the evidenc seems favorable to the former view. The formation of the great bodie of gold-bearing quartz along the Mother Lode, which are sometime massive and sometimes finely ribboned, are inexplicable on the theor of open fissures.

The Comstock deposits are of much more recent age than those of th Mother Lode, and are still in process of formation. In some of th deeper portions of these mines the temperature reaches 170° F., sufficien

scald flesh when immersed in it. It is probable that nowhere else in he world has mining been carried on under such difficulties of this nd. The gold deposits of California rarely show much increase in mperature with depth, and they were either not formed under condi- ons of such high temperature, or the lapse of time has been sufficient cool the percolating waters.

Our chief interest at the present time lies with the gold deposits in he Sierra Nevadas, and particularly with the Mother Lode. The careful udy which geologists have recently given to this great range of moun- ins has proved the fallacy of many views formerly held in regard to eology, as well as the occurrence of ore-deposits. Granite used to be onsidered the primitive crust of the globe and to be the most ancient of ll rocks, but in the Sierra Nevadas, where it is so extensively developed, appears to be comparatively recent, geologically speaking. In the lder text-books on the subject of ore-deposits it is stated that gold in articular was formed in the most remote geological times. Careful bservation has shown, on the contrary, that its deposition is still going n in localities where the conditions are favorable. The geological rocesses which have been at work modeling and remodeling the outer urface of the globe, as well as those deep-seated chemical and physical orces, have never ceased for a moment, and are still constantly at work, s any careful observer can readily perceive. We are living on a portion f the globe where the mighty energies within are comparatively qui- scent at the present time, but we do not know how long this will last.

The Sierra Nevada is not an ancient range of mountains, geologically onsidered. During the earlier periods water covered the most of the egion now occupied by that mountain range. At the close of the eological period which we call the Jurassic, there was an unparalleled isturbance along eastern California: the bed of the sea was uplifted, he strata folded together, and involved in an enormous body of molten ranite. After this had cooled, and following the formation of an xtensive system of faulting, which we notice occasionally even to-day, n the shape of earthquake shocks, the gold-bearing quartz veins were ormed. In all probability they were due to the agency of warm springs, whose number as well as volume must have been enormous.

At this time the Sierras was a high and rugged range, perhaps more levated than at present. Through long ages the action of atmospheric gencies was exerted upon the mountains. Rain and frost disintegrated he rocks, and the rushing rivers carried the detritus down to the valleys. In this manner the mountains were gradually reduced to a level much elow the present. The cañons widened to valleys and the high peaks slowly wasted away until the great range of mountains was reduced to a comparatively low, gently sloping elevation. While the most of the detritus had been transported to the Sacramento and San Joaquin val- leys during the earlier period of erosion, much of the coarser material gathered toward the last in the broad beds of the sluggish streams. During this process of erosion the numerous quartz veins were, of course, also broken up and the freed gold, having so high a specific gravity, collected in the beds of these rivers. The remnants of those ancient streams we recognize to-day as the "auriferous gravel channels." They owe their richness to the enormous amount of erosion which had taken place, an amount equal to a layer of rock several thousand feet in thickness.

After the auriferous channels were filled disturbances began to take place on the higher parts of the mountains, and streams of molten lava flowed down the beds of some of the rivers, while in others volcanic ash and bowlders of lava were brought down by the water. In this manner the auriferous gravel channels were buried by what we call the "lava cap." Our study of the mountains has shown that these lava-flows were brought about by the formation of a fault line along the eastern side of the Sierras, accompanied by the gradual elevation of the range. As the mountains kept rising there was an increase in the rainfall, and the streams again began to cut into their beds. Owing to the hardness of the lava cap, new channels were generally formed by the side of the ancient ones. The streams everywhere made use of the lowest depressions and the most easily eroded surfaces, until to-day we see the result in the cañons of the present streams, which are often one to two thousand feet deep. They cross and recross the ancient gravel channels or flow by their sides.

Gold-bearing quartz veins are found in the mountainous portions of nearly the whole State of California. They occur in association with all the different kinds of metamorphic and eruptive rocks, but are particularly abundant in what has been termed the "auriferous slate" or "bedrock series." With one or two exceptions they are not found in the formations later than the Jurassic, a fact which the study of geology has brought out, and which should be borne in mind in prospecting particularly in the Coast Range.

Of all the many districts in the State, interest has centered most about the great mineral belt known as the Mother Lode. So great has been and is still the charm of this name, that people have sometimes refused to look at mines which were not on the Mother Lode, while all mines thus located have often been considered valuable by those not familiar with the actual conditions.

Let us see first what is meant by the term Mother Lode. So various have been the applications of the name that it is rather difficult to form a definition which shall please everybody. By many it has been held to embrace the whole of the mineral belt lying along the western slope of the Sierra Nevadas, and some have even extended it into Mexico on the south and British Columbia on the north.

If we examine a geological map of the Sierra Nevadas we shall see that, beginning in Mariposa County and extending northward until covered by the volcanic rocks in Plumas County, there is a widening belt of slates with associated dikes of eruptive rocks, which have been referred to before as the bedrock series. Gold-bearing quartz veins occur over much of this area, and an examination reveals the fact that through some of the distance they can be separated into three general divisions: the lower, the middle, and the upper belts. The middle one is the most regular and continuous, and by far the most productive through the most of the counties on the western slope of the Sierras. It is the one on which custom is almost unanimous in bestowing the term Mother Lode.

The Mother Lode might be defined, then, as a mineralized zone of varying width, sometimes reaching over a mile, and extending continuously through the counties of Mariposa, Tuolumne, Calaveras, Amador, El Dorado, and possibly farther north. Through a portion of this distance it is characterized by the presence of one main fissure

remarkable proportions, while in other places, where the conditions ere different, it consists of a number of parallel fissures occupied by uartz veins. The lode is associated with a narrow and almost con-nuous belt of black slate, called the Mariposa beds, while the veins cur either in the slate or on the contact between it and the diabase kes, which are known among the miners as "greenstone."

The remarkable regularity and continuity of the fissures of the other Lode are due in great part to the geological structure. This gularity in structure has been caused by the fact that the slates have ot been crushed and broken, but uniformly tilted at a steep angle when ie mountains were first formed. The bedding planes of the slates, as ell as the contact between them and the eruptive dikes, offer lines of eakness subject to movement, and along these lines the mineral-bear-g solutions have carried on their work.

As far as can be learned, the term Mother Lode was first applied to ie veins worked at Nashville, 12 miles south of Placerville, in the latter art of 1850 or the early part of 1851. In the use of the term Mother ode it is not intended to convey the idea of a genetic relation to other des or veins, although it is likely that from the size, extent, and rich-ess of this series of veins, the early miners first used the expression artly with this significance, and partly, perhaps, meaning the source om which came the great wealth of the surface placers.

The magnitude of the operations along the Mother Lode gold belt nce the earliest days of mining in California, and the importance of a orough knowledge of the occurrence of its ores, are best illustrated by ie fact that over the whole length of the lode, a distance of more than ie hundred miles, there is an almost continuous series of mineral loca-ons, comprising more than five hundred patented claims and as many ore unpatented ones.

The lode follows in a general way the northwest and southeast trend the mountains, the veins conforming, as a usual thing, to the course the stratification of the inclosing rocks, with a dip of 40° to 75°. None the other belts begin to compare in extent or regularity with the other Lode. A peculiar feature of many portions of the lode is the resence of a green vein matter, called mariposite. This is associated ith the carbonates of lime, magnesia, and iron. The large amount of on is the cause of the red croppings, over which one can sometimes alk almost continuously for many miles.

As an example of the magnitude which the Mother Lode sometimes ssumes, Quartz Mountain, Calaveras County, affords a good illustra-on. The mountain is about 600′ wide, nearly half a mile long, and 50′ high. It is composed wholly of quartz and vein matter, the latter onsisting of mariposite and dolomitic material. In the middle, and rming the summit, is a great body of massive quartz. On the west de is another vein of quartz nearly as large, and on the east a smaller ie. The vein matter between the larger quartz veins is completely lled with a network of small veins.

The greatest exposure of quartz is on the Mariposa Grant, in Bear alley, Mariposa County. It is 20′ thick at the base, 150′ long, and ses 80′, with a dip of 70°.

In Mariposa County the lode is characterized by two main veins: first, ie one extending north from Princeton through Bear Valley and along ie Merced River, constituting the west vein at Coulterville. The other,

beginning north of the Merced River, outcrops almost continuousl through Coulterville to Moccasin Creek. From there the fissure con tinues into Tuolumne County, although containing but little quartz fo a number of miles. The lode is widest at Quartz Mountain, and her as well as north and south for several miles, there are two or mo parallel veins. The country rock adjoining the veins on either side filled with small pocket veins much of the distance through Tuolumn County.

In Calaveras County the lode is most prominently exposed at Carso Hill, Angels Camp, and in the vicinity of the Mokelumne River. Th largest nugget ever found in the State was obtained from a shaft on th summit of Carson Hill. Through central Calaveras County the slat do not lie in the direct course of the lode, and the latter is considerabl scattered. The slates, however, are again encountered on the course the lode at the Gwin Mine, and it follows them into Amador County.

Through Amador County the lode is nowhere confined to a sing vein, but consists of a series of them, occupying a width of nearly a mi in many places. The numerous veins through this county are probabl due to the many parallel dikes of greenstone inclosed within the slates

In El Dorado County the veins are also scattered through the blac slates, although the main vein is often found near the eastern edg West of Placerville, the slates are cut by large bodies of eruptives fo several miles, and while the course of the main lode is clearly marke it is not sharply distinguished from the broad mineral belt below.

The veins of the lode almost invariably dip a few degrees less tha the inclosing rocks, and it is usual to find the foot-wall rocks, especiall when they consist of slate, bent away from the normal dip, correspondin to that of the vein; hence it is probable that the hanging-wall has bee pushed up. If this is the case it would indicate an upward strai along the mountain range which tended to relieve itself in the fissur of the lode.

That the lode is a true fissure is amply proved by the univers presence of gouge seams. The movement of the walls of some of th fissures has been immense. This is made easy because of their lengt The great width of the ground-up wall rocks, sometimes reaching 3 indicates a long continuance of the movement, probably more or le oscillatory, with a general rise of the hanging-wall. The greatest dep to which the lode has been opened, about 2,200′, shows no weakening the veins or deterioration of the ore. It is not likely that any hig degree of heat will be encountered at any depth that can be reached the ordinary course of mining, for as yet it is not noticeable.

The depth to which gold-bearing veins extend is an open questio and probably differs in different localities. It is probable that they wi be found to hold out along the Mother Lode to the greatest depths which the expense of handling the ore will permit them to be worke They may extend to those depths at which the pressure is so great th the rocks move through plasticity rather than through faulting.

In studying the occurrence of gold and its ores along the Moth Lode, no relation has yet been found to exist between the character the walls and the poverty or richness of the quartz. It is recogniz that a vein lying at the contact of two different formations is mo regular and the mineral contents more evenly distributed than one lyi in a formation which does not easily afford a regularly defined fissu

lo not believe that in the case of the Mother Lode the mineral char-
ter of the walls has influenced the deposit; that is, in the sense of
e mineral contents having been derived directly from them. The
nes of the lode are equally rich whether in slate, or at the contact of
e slate with the greenstone, or in any of the rocks which occur. Good
nes as well as poor mines can be found under any of these con-
ions. I do not think that any combination of wall-rocks will insure
ich vein, but that the deposit of the metallic particles is dependent
re upon certain chemical reactions taking place in the solutions cir-
lating in the fissure. This is proved by the fact that of two veins
ing side by side in the same mine, one may be barren, and the other
nstitute the pay-rock. The rock which constitutes the walls on the
rface, or at any depth which can be reached, is no indication what-
er of the character of the deep-seated portions of the crust from which
e circulating fluids abstracted their mineral contents. The real con-
tions are certainly complex, differing greatly in different localities.
ne same character of ore is rich in one place and poor in another, with-
t any apparent reason for it. Any one mining district is apt to be
aracterized by certain peculiarities, and a study of these is the best
ide to go by in that district, but they may be misleading in another.

An erroneous idea common among prospectors is that a vein should
prove as depth increases. As a matter of fact veins are very irregular,
th in depth and lateral extent. They pinch to mere seams and then
ell to a width of many feet. These changes take place without any
stem, and are due to the very irregular manner in which the wall
aterial has been removed by the mineral solutions, or possibly in some
ses to the movements of the walls bringing two protuberances or two
pressions together.

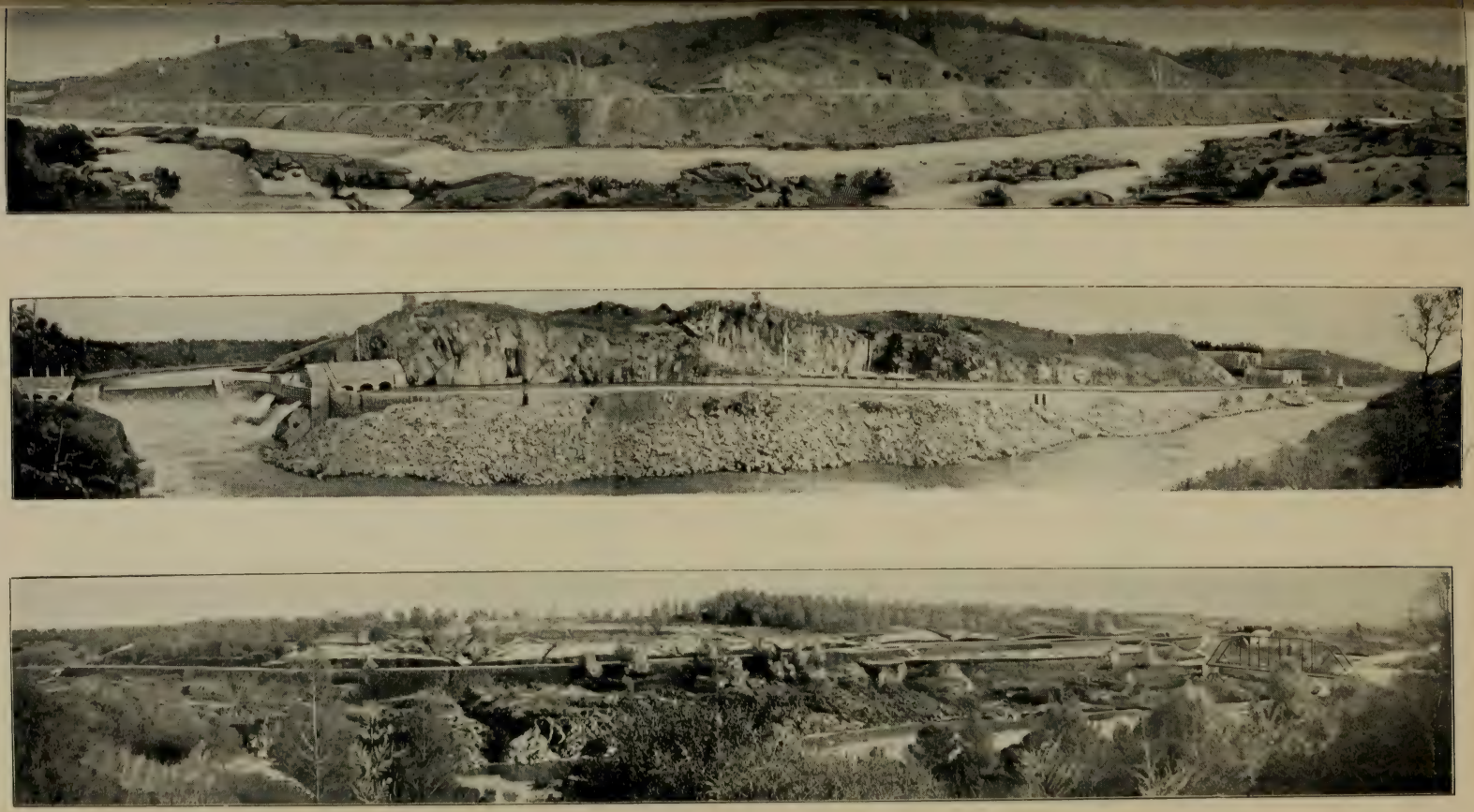
It must be clearly borne in mind that the present surface of the
estern slope of the Sierra Nevadas was not the surface at the time of
e formation of the gold-bearing veins. Since that period several
ousand feet in depth of the rock with the inclosing quartz veins have
en worn away. Consequently, it is a mere accident what portion of
e vein is at present exposed on the surface. As all veins swell and
nch, having shoots of ore between which are barren places, erosion
ay have left on the surface merely the lower end of a shoot, which
ight be exhausted in less than a hundred feet; or it may equally well
ave merely exposed the upper end of such a shoot. In the former case
e vein would grow smaller or poorer, and soon a barren stretch be
ached which might be nothing more than a seam of clay or broken
ck. In the instance where erosion has just exposed the upper end of
shoot the phenomena observed in opening the mine would seem to sup-
rt the view that veins grow richer in depth. In the case of the veins
hich soon pinch out a little perseverance would in most cases be
warded by again meeting the ore-body. This condition of things has
ten been illustrated along the Mother Lode. Many mines have been
andoned because it was supposed that the vein had given out. Some
these mines have been reopened later, and with more careful exploita-
on have been found to be valuable still. A thorough knowledge of the
currence of ore-deposits would have prevented a large number of these
ilures.

Many failures also occur in mining because of a lack of a thorough
udy of the kind of treatment which the particular ore requires in

order to save the gold. As many failures have occurred, probably, fo this reason as for any other.

There is a change of importance in the character of the ore of man mines as the depth increases, which is frequently overlooked in dete mining the kind of mill to erect. The upper portions of most or deposits are more or less completely oxidized, leaving the gold in a fr state—that is, uncombined with other metals—while below the oxidize zone, which varies in depth in different places, its condition is differen The depth of the alteration is conditioned by the extent to which th deposit has been affected by atmospheric agencies. Below this line oxidization, which is sometimes called the water-line, the precio metals are often wholly or in part combined chemically with base meta from which they have to be separated by either roasting and chlorin tion or by the cyanide process. Along the Mother Lode much of th gold is found in the free state at the greatest depths reached, but i other portions of California there is often very little free gold to b found after getting down a few hundred feet.

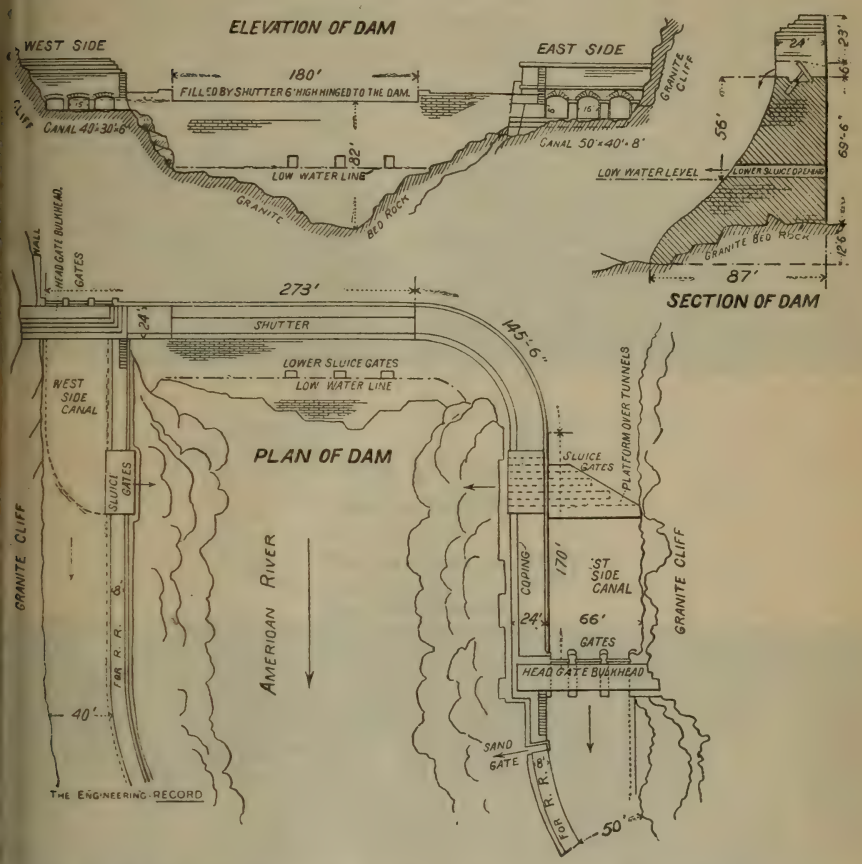
There is, without doubt, no such series of gold-bearing veins as tho constituting the Mother Lode to be found elsewhere in the worl While the number of patented mines already exceeds five hundre mining here is yet in its infancy. With more careful exploitation an better means of saving the gold, many more mines can undoubtedly b operated. Wildcat speculation has had and is still having, to son extent, a baneful effect upon the industry. Many people have come look with suspicion upon all mining ventures because of the number failures. It is believed that the time is coming when mining will b considered as legitimate a business as any other, and that it will demar less risk for the investment of money than is required in many oth pursuits.



Panoramic View of the Dam and Canal of the Sacramento Electric Power and Light Company.

# ELECTRIC-POWER TRANSMISSION PLANTS IN CALIFORNIA.

By W. F. C. Hasson.




Outline Plan of Dam and Headworks of the Sacramento Electric Power and Light Company.

During the past two years the development of water-power in California, and its electric transmission, has rapidly advanced.

## SACRAMENTO ELECTRIC POWER AND LIGHT COMPANY.

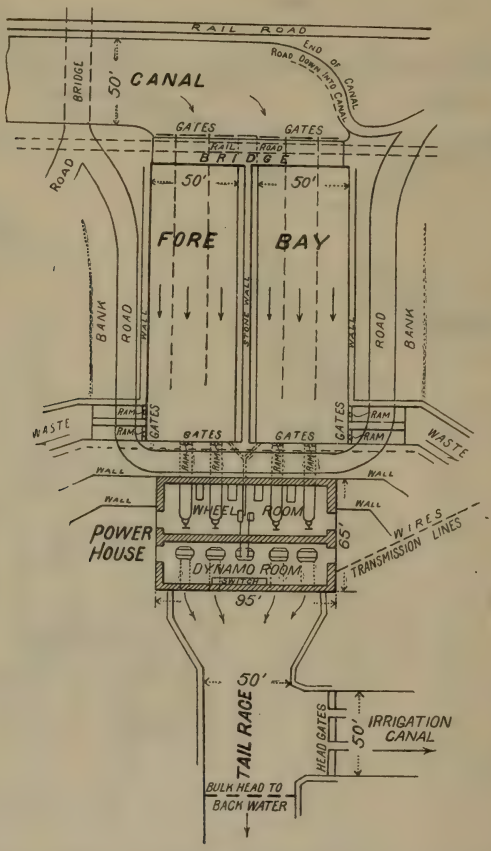
The most extensive plant installed is that of the Sacramento Electric Power and Light Company, at Folsom, California. This plant consists of four 750 K.W. three-phase alternating-current generators, driven by four sets of 30" McCormick turbines, each having a capacity of 1,260 H.P. The generating E. M. F. is 800 volts, and the current is then transformed to 11,000 volts for transmission to the sub-station at Sacramento, a distance of 22.75 miles. At the sub-station are three 250 H.P. synchronous motors which drive a counter-shaft, to which are belted four

direct-current generators supplying a 500-volt current for railway pu poses, and five arc-lights machines. From this sub-station the followir classes of current are distributed, distances ranging as high as 5 mile

(*a*) 500-volt direct current for railway purposes;

(*b*) 500-volt alternating current for motor purposes;

(*c*) 200-volt alternating current four-wire system for incandescer lighting purposes in the center of the city;




Outline Plan of Canal, Fore-bay, Power-House, and Tail Race at Folsom.

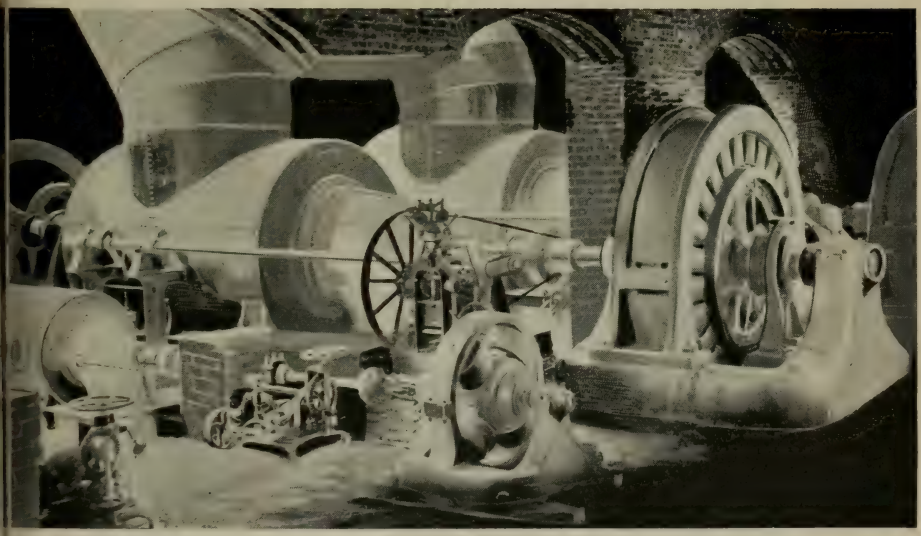
(*d*) 1,000-volt alternating current for incandescent lighting in th outlying districts.

The machinery was started July 14, 1895, and is now supplying cu rent for operating the following:

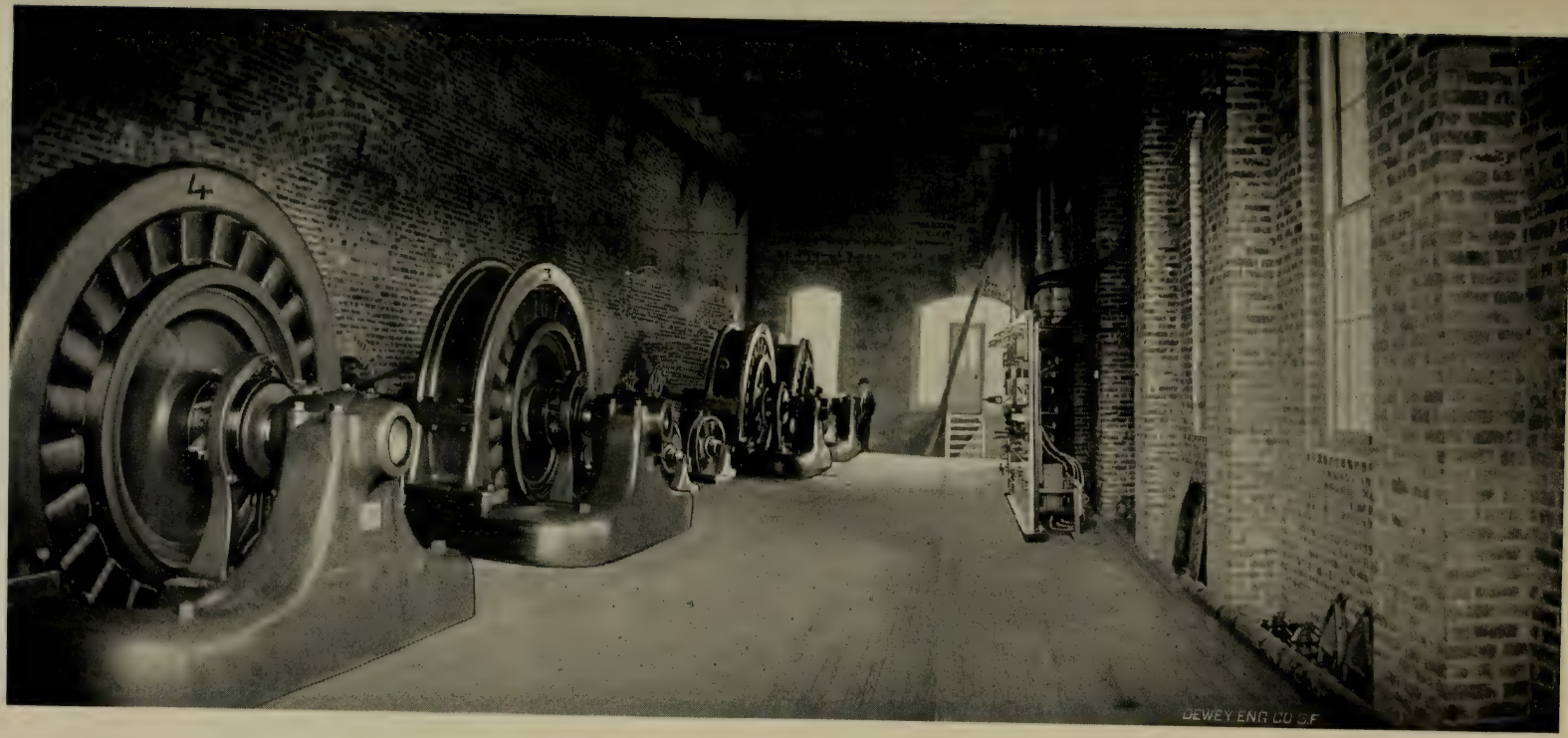
| | |
|---|---|
| Incandescent lights | 12,662 |
| Public arc lamps | 234 |
| Private arc lamps | 348 |
| Alternating-current motors | 537 H.P. |

Also, the entire street railway system of Sacramento, which has 24 miles of single track and 17 miles of double track, and operates from 2 to 35 cars. In addition to this, motors aggregating in capacity 200 H.I are now being installed.

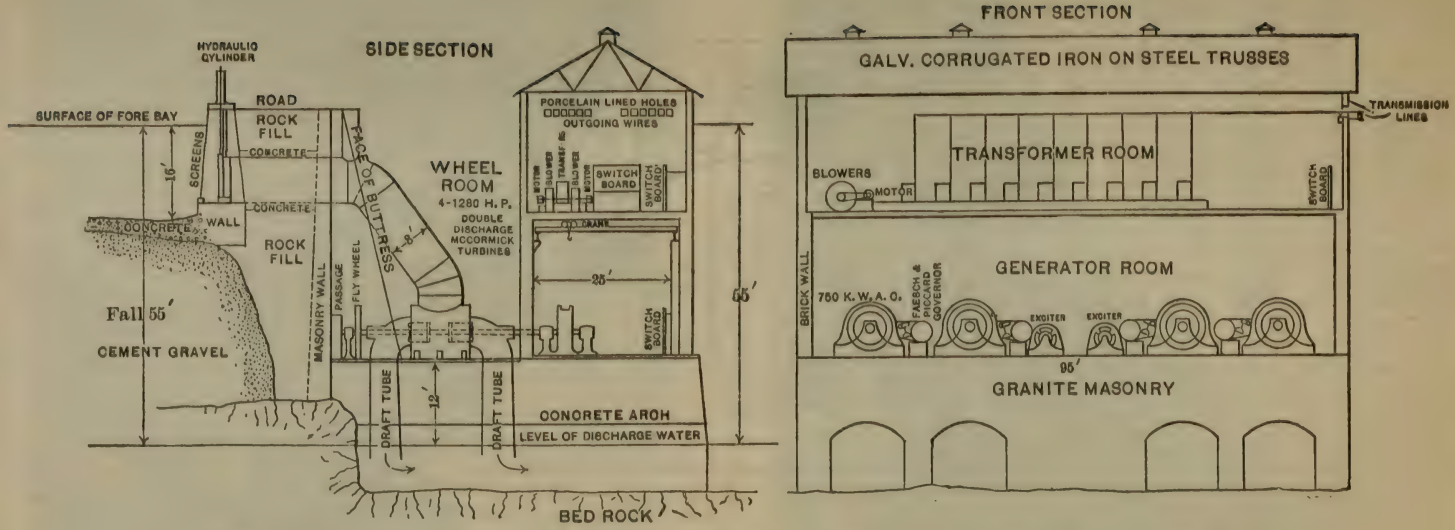
State Power-House Across Canal at Represa.



tional View Showing Connection of Turbines, Generators, Water-wheel Governors, and Exciters at the Folsom Power-House.




Generator-Room of the Power-House at Folsom.



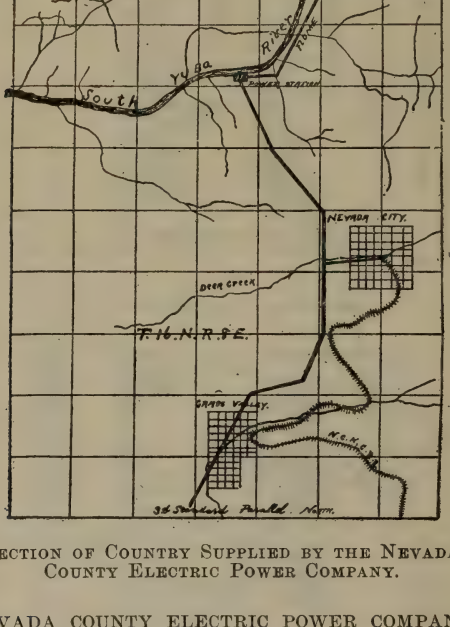

SECTIONAL OUTLINES OF FORE-BAY, HYDRAULIC AND ELECTRIC PLANTS, AT THE FOLSOM POWER-HOUSE.

The power supplied is utilized for a great variety of purposes, such a running the machine shops of the Southern Pacific Railroad Compan breweries, printing offices, flour mills, and elevators.

Great care was taken, in designing this plant, to adopt all precautio to secure a permanent operation essential to supplying power for mult farious purposes in the city.

The transmission line from Folsom to Sacramento consists of a doubl pole line of carefully selected Washington cedar poles, 40′ in length ar measuring 16″ at the butt.

The class of work is such as to develop all the serious difficulties regulation arising in the utilization of water-power. Much experimen ing has been done to perfect the regulation, and the work now beir done shows that this has been fairly accomplished.




SECTION OF COUNTRY SUPPLIED BY THE NEVADA COUNTY ELECTRIC POWER COMPANY.

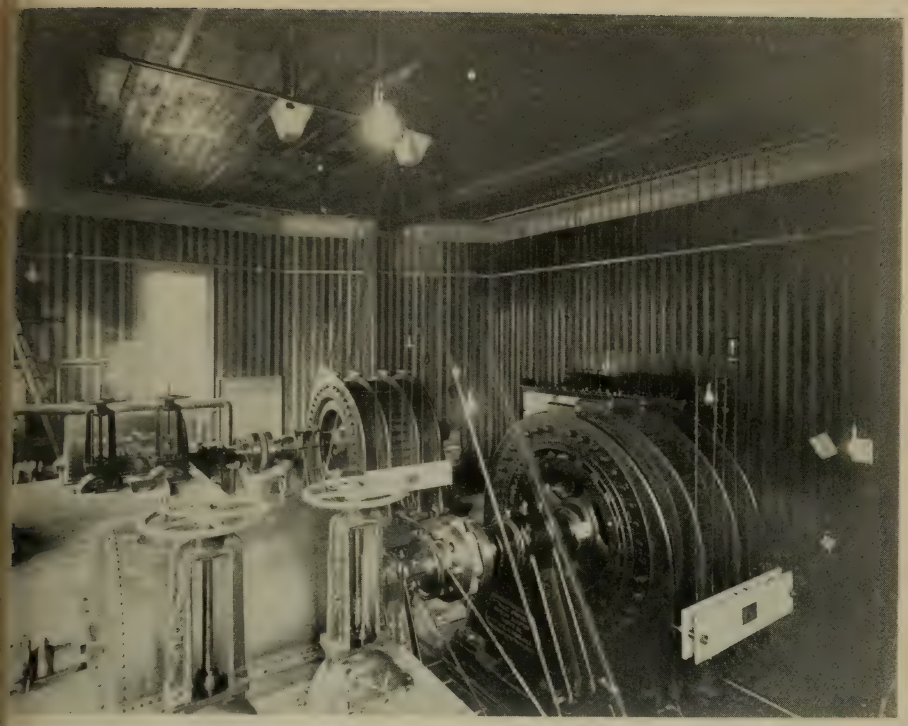
## NEVADA COUNTY ELECTRIC POWER COMPANY.

Several years ago, an effort was made to construct a dam in the Sout Yuba River, with the idea of utilizing the water-power. During th past year, a log-cribbed dam, 32′ high and 206′ in length on the cres has been constructed, and the water thus diverted is carried in flumes distance of 3½ miles, until a head of 206′ is obtained. At this poi have been installed two alternating-current Stanley generators havi a capacity of 340 K.W., directly connected to, and driven by, two Pelto water-wheels, each having a capacity of 500 H.P. These dynam generate current directly at a potential of 5,500 volts.

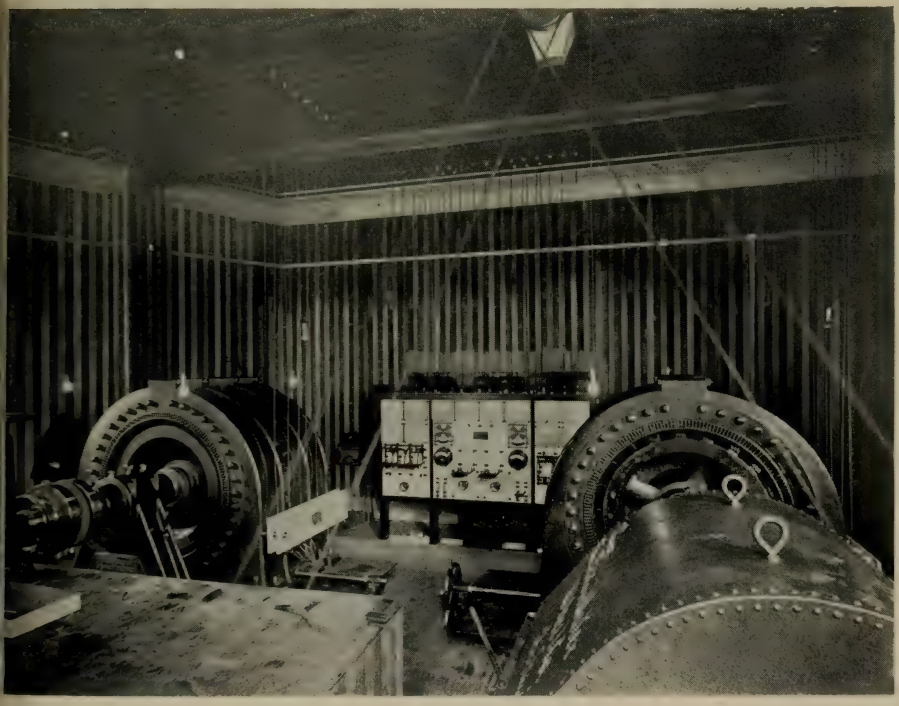
The current thus generated is transmitted 4 miles to Nevada Cit and thence 4 miles to Grass Valley, where it is used to supply all th public and private lights and the small demands for power. Divergi lines are carried to the mining districts, and power is now being su plied to the Red Hill Mine for one 30 H.P. motor, and to the Gold Hi Mine for one 160 H.P. motor. This latter drives an air-compresso

Power-House, Nevada County Electric Company.

Dam in Yuba River, Nevada County Electric Company.



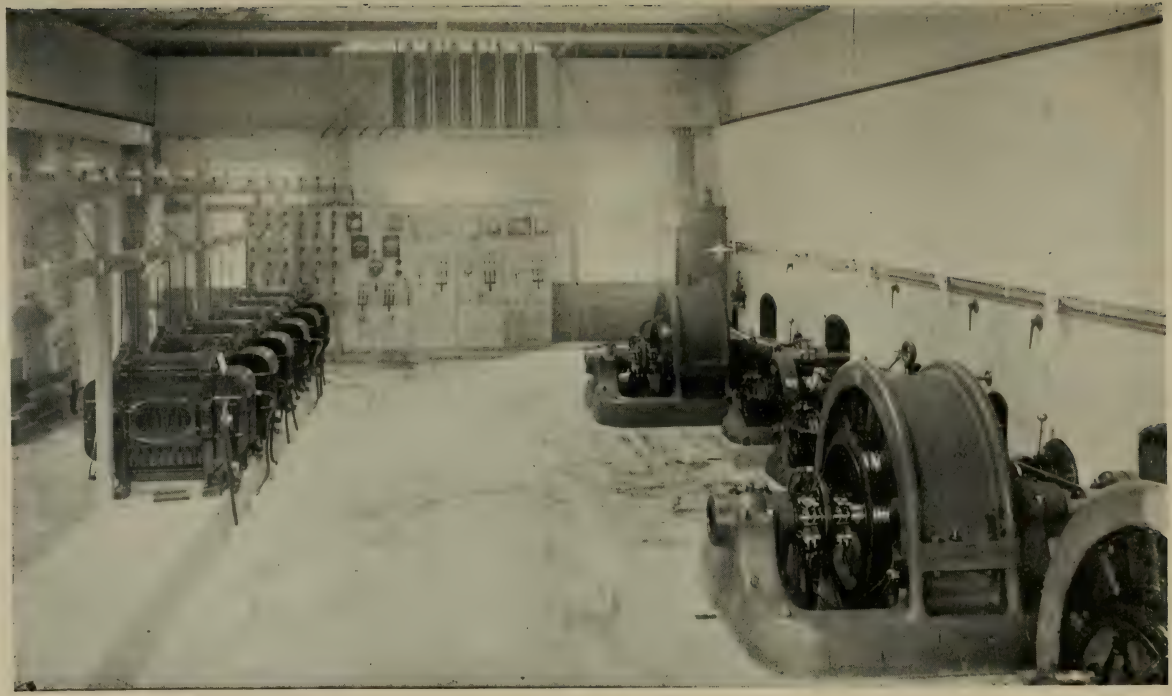
Interior of Power-House, Nevada County Electric Company.



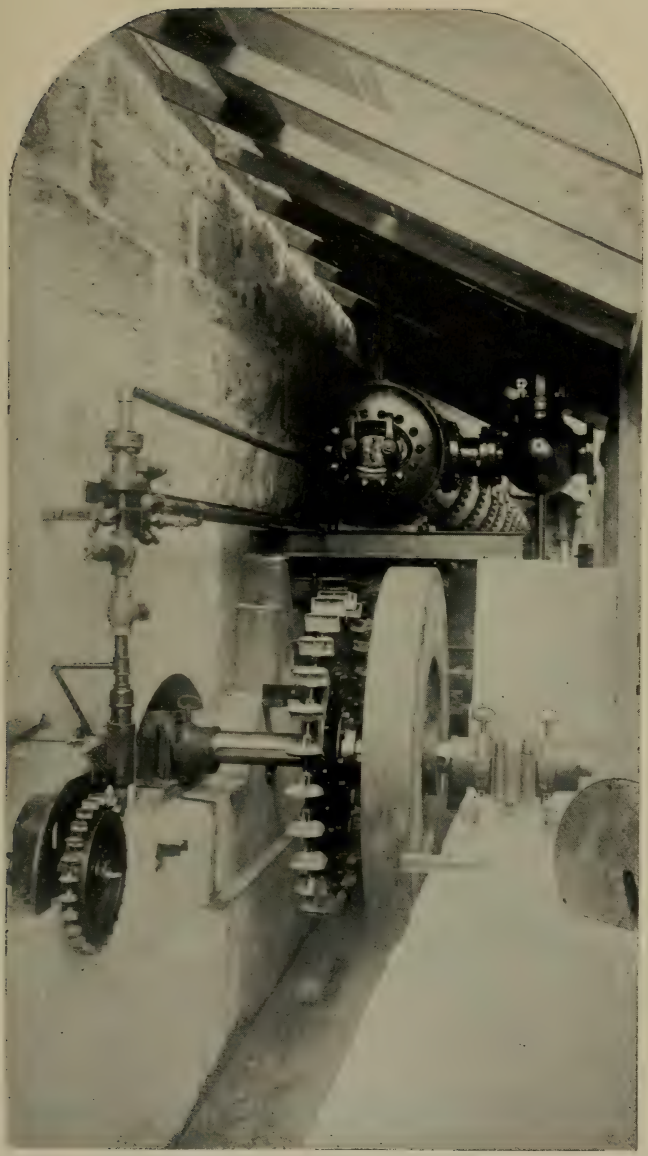
Interior of Power-House, Nevada County Electric Company.

View of Reservoir Mountain, Pipe-Line, and Power-House of the San Joaquin Electric Company.

POWER-HOUSE OF SAN JOAQUIN ELECTRIC COMPANY, SHOWING MODE OF WITHSTANDING THE END-THRUST OF PIPE-LINE.



Interior View of Power-House of the San Joaquin Electric Company.



Water-Wheel Mountings, Showing Fly-Wheel, Exciter, and Lower End of Receiver, San Joaquin Electric Co.

hich, in turn, operates the pumps, hoists, and other parts of the min-
ıg machinery.

Work on this plant was commenced about June 1, 1895, and the
ıachinery was started on February 4, 1896, since which time it has
een in continuous successful operation.

This plant is of great importance in that, due to the high price of
ıel, many mines in this famous mining region have been shut down
›r lack of a cheap power. Interest in mines has been revived, and old
ıines that are known to be of excellent value are now being reopened.

### SAN JOAQUIN ELECTRIC COMPANY.

This plant consists of three 360 K. W. general electric three-phase
enerators, driven by Pelton water-wheels. The power is transmitted at
potential of 10,000 volts, a distance of 35 miles to Fresno, where,
lthough the plant has been in operation but a short time, it already
upplies power for a variety of purposes; such as—

| | |
|---|---|
| Flour-mill | 180 H.P. |
| Water company, for pumping purposes | 75 H.P. |
| Arc lights | 120 H.P. |
| Planing-mill | 30 H.P. |
| Elevators, printing offices, feed-mills, packing-houses, etc.; various small motors, aggregating | 65 H.P. |

About 3,000 incandescent lights.

### POWER DEVELOPMENT COMPANY.

This company is now installing two 450 K. W. general electric three-
hase generators, to be driven by Girard water-wheels, and transmitting
ower, at a line potential of 10,000 volts, a distance of 16 miles to
3akersfield. The power will be used for multifarious purposes, but
ırgely for pumping water for irrigation. The plant will be completed
ıithin a few weeks.

### TUOLUMNE COUNTY ELECTRIC LIGHT AND POWER COMPANY.

This company has installed one 150 K. W. general electric three-phase
enerator, driven by a Pelton water-wheel. The power thus generated
ı transmitted, at a line potential of 10,000 volts, a distance of 12 miles
› the Rawhide Mine and a marble mill, where it is used for driving
oists, stamps, rock-breakers, and other motors. It is the intention of
he company shortly to double the capacity of its generating plant.

### SPRING CREEK ELECTRIC POWER COMPANY.

This company has installed two 100 K. W. general electric three-phase
enerators, driven by Pelton water-wheels. The power is transmitted, at
line potential of 2,080 volts, distances ranging from 1½ to 5 miles in
he vicinity of Redding, California, where, in addition to supplying
›ower for incandescent lighting, it supplies the Texas Consolidated Gold
Iining Co. with power for motors for running stamps, rock-breaker,
nd hoist.

In addition to the above, the following machines have been, or ar being installed by the WESTINGHOUSE ELECTRIC AND MANUFACTURIN COMPANY, and are in all cases driven by water-power and Pelton wate wheels :

Gwin Mining Development Co.
One 7½ K.W. 125-volt generator for lighting mill.

Cons. Golden Gate Mining Co.
One 7½ K.W. 125-volt generator for lighting mill.

Plymouth Rock Mine.
One 3¾ K.W. lighting generator.

B. E. Letang, Jackson, Cal.
One 30 K.W. single-phase 1,100-volt alternator.

Oroville Gas, Electric Light, and Power Co., Oroville.
One 60 K.W. single-phase, 2,200-volt alternator.

Big Creek Power Co., Santa Cruz, Cal.
Two 150 K.W two-phase generators. Distance of transmission, 18 miles; potenti of line, 10,000 volts. Used for power and lighting in Santa Cruz.

Santa Ysabel Gold Mining Co., Quartz Mountain, Cal.
Two 60 K.W. 500-volt generators. Used for operating several hoists. Distance transmission, 2,000′ to 4,000′.

Central California Electric Co., Auburn, Cal.
Two 400 K.W. two-phase generators. Line potential, 15,000 volts. Distance transmission, 30 miles. Objective point, Sacramento.

Utica Mine, Angel's Camp, Cal.
One 150 K.W. 2,500-volt single-phase alternator. Distance of transmission, 8 miles.

Stanislaus Milling and Power Co., Knight's Ferry, Cal.
One 37½ K.W. alternator. Distance of transmission, 13 miles. Potential of lin 5,000 volts.

Watsonville Electric Light Co., Watsonville, Cal.
Two 45 K.W. two-phase alternators. Distance of transmission, about 2 mile Potential of generators, 2,200 volts.

Fort Jones, Cal.
One 45 K.W. two-phase generator. Distance of transmission, about 1 mile. Pote tial, 2,200 volts.

Redding Electric Light Co., Redding, Cal.
One 75 K.W. 2,200-volt, single-phase alternator. Used for lighting purposes.

Pasadena & Mount Wilson Railway Co., Pasadena, Cal.
One 30 K.W. alternating-current generator. Potential, 2,000 volts.

Thorough investigations have been made of the Kern, San Gabrie Stanislaus, Pitt, and McCloud rivers, with a view of determining th feasibility of utilizing them for water-power. The development of the powers now depends only upon the procuring of the necessary capita and the development of permanent markets.

The average cost for the transmission plants ranging from 13 to 2 miles, when the capacity of the plant is greater than 1,000 horse-powe ranges from $100 to $140 per horse-power.

The fixed charges for maintenance and operation range from $13 5 to $30 per horse-power per annum.

SAN FRANCISCO, September 12, 1896.

# THE SAMPLING AND MEASUREMENT OF ORE-BODIES IN MINE EXAMINATIONS.

By Edmund B. Kirby.

Read at meeting of the Colorado Scientific Society, December 3, 1894.

Investors who contemplate the purchase of mining property, or who have to decide some question of business policy concerning property they already own, are frequently unable to judge of such enterprises, or lack the time to investigate for themselves. It is then customary to call in the aid of some experienced mining engineer, in whose judgment and integrity absolute reliance is placed. Such men, who make a specialty of mine examinations, now constitute a large class of the engineering profession, and are commonly known as "mining experts."

The work is peculiar in that the engineer is generally called upon, not merely for his opinion on technical points, but as the judge of the investment. This makes the responsibility unusually heavy, since his decision is generally accepted as final, and the amounts involved are large.

## THE SCOPE OF EXAMINATIONS.

The examination of a mining property necessitates an inquiry into everything that bears upon its value as an investment. Among the principal facts to be determined are: the net value of ore already discovered, the chances indicated for further discoveries, the best metallurgical treatment, and the past record of the property. Estimates are required of operating expenses, costs of development, equipment, etc., together with the profit to be expected. The price and terms of payment, the working capital needed, and the time required for its recovery, the question of title, the risks from litigation, flooding, and other accidents, also enter the problem.

After these and all other pertinent facts have been carefully determined and arranged clearly before the mind, the main question at issue, of investment or policy, is decided by that business judgment which comes only from experience and knows no set rules or formulæ.

## ESTIMATES OF DISCOVERED ORE AND THEIR RELATIVE IMPORTANCE.

It is the object of this paper to discuss only one part of the work thus outlined: the valuation of discovered ore by sampling and measurement. This has little or no importance in some cases, either because no ore has yet been found, or its quantity is small, or other matters are sufficient to decide the question of investment. In other mines the amount of discovered ore is one of the chief considerations, and requires an accurate estimate. This is a difficult and laborious undertaking,

often calling for every resource of technical skill. But little has been published upon the subject in professional literature, and every engineer has selected or evolved his own methods, generally with little knowledge of, or reference to, those of others. It is therefore intended to describe the methods which the writer has found most effective, in the hope that others engaged in the same field may also contribute to this important subject.

## TERMS DEFINED.

It is desirable to first define the exact sense in which the following terms will be used in this article:

*Ore-shoots* are those portions of an ore-deposit where the ore-bodies are so frequent, or so grouped, that partial boundaries of some definite shape and direction may be drawn around them, and such specially productive portions thus distinguished from the rest. The term is also applied to a single ore-body which has considerable extension in one direction.

An *ore-body* is, in general, a solid and fairly continuous mass of ore which may include low-grade and waste as well as pay-ore, but is individualized by form or character from adjoining parts of the deposit.

*Pay-ore* includes those parts of the ore-body which are both rich enough and large enough to stope with profit.

In order that the facts may be clearly presented to the mind, the discovered ore is separated into two classes: *ore in sight* and *probable ore*.

"*Ore in sight*" is that contained in blocked portions of the deposit each of which is so clearly exposed (by sections on several sides) that the limits, continuity, and value of its contents may be determined and relied upon with reasonable certainty. Such ore is thus a proven resource ready for extraction, and is expressed in terms of net profit.

"*Probable ore*" is a more elastic term, and includes any blocked ore not certain enough to be "in sight," and all ore which is exposed for sampling, but whose limits and continuity have not been proved by blocking. It may also include any undiscovered ore which from the evidence is too strongly probable to be classed under the heading "chances indicated." Probable ore may be estimated in several distinct divisions, and the relative degree of probability assigned to each.

In practice, the ore-shoots and ore-bodies of a deposit, themselves irregular in form, are found penetrated by every conceivable arrangement of mine workings, from orderly shafts and levels to the "corkscrew rat-holes" of the prospector or lessee. Thus, every mine presents its own special problems.

The work of sampling and measuring both classes of ore is carried on at the same time and by the same methods. It is intended to estimate only the pay-ore; and since its practical limits are those which will afterward be defined by the actual stopes, it becomes necessary to ascertain what the shape and extent of these excavations will be, and measure only the ore within their limits.

In order to secure working room, the dimensions of the stopes will often be greater than those of the pay-ore, and will thus also include barren rock and non-profitable ore. No attention is paid to these worthless portions if they can be kept separate in breaking. If, however, ore streaks and waste are so intermingled that it will be necessary to break them down together and sort out the richer portions afterward, the

measurements and samples are then made on the entire average mass as it stands.

## SAMPLING ORE "IN PLACE."

### The Four General Systems in Use.

1. A large number of small samples for assay, each of which is quickly and roughly taken, are cut from lines distributed at small intervals over the area of each plane section.

2. A limited number of large samples for assay, each carefully and laboriously taken, are cut from lines distributed at wider intervals.

3. Mill-runs. In this system each sample is either sent to a mill, where its actual yield is ascertained, or it is shipped to some sampling or smelting works, where an assayer's pulp is prepared from it by accurate sample reduction with machinery. The samples are very few in number on account of the time and expense required. In the first case, each one must be large so that it may be milled by itself and furnish enough product to clean up. In order that a sample may be representative, it is generally composed of ore from several points.

4. Panning in a miner's gold pan, or horn. This test is applied to a large number of very small samples, each of which has been roughly taken and pulverized for the purpose on a stone, or buck-board, or in a mortar.

### Considerations in Selecting a System.

The *first system* is adopted to save time and expense whenever the second or third is unnecessary. There are many samples to assay, but the work of taking each one is small. It gives correct results only when applied to soft ore-bodies where the sample may be cut out easily and uniformly by pick, gad, or moil. The method is permissible only when the richest portions of the ore are not too much scattered in spots, streaks, or special layers, and are not too high in grade. In other cases it is applicable to very thin sheets of ore. It is frequently used on sections of probable ore, and for daily working samples in the operation of a mine, or in other cases where a quick, rough approximation is desired. Each sample may be small, requiring reduction to only one half or one fourth its bulk for the final package; again, it is often sufficient to break so little from each point that it may be sent entire to the assay office. There may be a large error in any single sample, but this is balanced in averaging by the great number taken.

The *second system* is necessary for all hard ore (requiring blasting), and for bodies in which the variations of value are great, or where the richest portions are irregularly distributed. It is always expensive and laborious, but generally the most accurate method, and is therefore most frequently employed. The sample broken is always large enough, from 25 pounds to 50 tons, to correctly represent the variations along the line of its cut, and is reduced to a small package for transportation to the assay office. Each sample is accurate, the error involved in the system being that due to the wide intervals between samples and the small number to be averaged.

The *third system* of "mill-runs" is rarely adopted unless a mill happens to be close at hand and the ore-body is of such size with values so variable or scattered that samples by the second system would be very

large (10 to 50 tons), and the work of hand reduction therefore very great. If mill-runs are sent to a sampling or smelting works, the expense and delay are generally greater and the results are no more serviceable than those of careful hand reduction at the mine. Mill-runs are more useful for metallurgical tests than to determine the value of ore in place. For the latter purpose their results are frequently deceptive and they are therefore dangerous in unskilled hands. This is because each mill-run is so tedious and expensive that few are made and thus but a few scattered points of the ore-deposit are tested. If each sample is composed of ore from various points, it is practically impossible to have the right proportion from each one, and the result is also subject to the serious errors of mixed samples. Again, the mill is often metallurgically unsuited to the ore, and it is more difficult to guard against fraud. When it is necessary to use this system, extra money and time should be provided for, and the samples made numerous enough for safety.

The *fourth system* of panning is restricted to free gold ore, and while it is not intended to furnish exact figures of value, it is very useful as an auxiliary method to determine the relative distribution of gold and the limits of pay-ore. In the regular operation of a mine it is often used to guide the work, and if checked frequently by assays or mill results mine foremen sometimes become remarkably expert in judging the exact value from pan tests. This cannot be done with unfamiliar ores, but even then it is generally possible to distinguish roughly between ore above and below pay.

*Distribution of Sample Lines.*—Each sample is cut along a line, making a trench, or groove, of the same dimensions throughout, and so placed as to cross any principal lines of variation in the grade or character of the ore. The lines of sample cuts are impartially distributed over the area of the plane sections adopted, in positions as nearly equidistant as possible. The boundary between pay-ore and low-grade, or waste, is provisionally fixed by judgment. If in doubt about a low-grade streak, a separate sample is made of it. The width sampled is always the width measured.

*Taking Samples.*—In the first system the sample cuts are shallow uniform grooves, say 3″ to 6″ deep and generally within 2′ or 3′ in length.

In the second system the quantity broken is fixed partly by the length of the line and partly by the distribution of values along it. The usual range is from 50 to 400 lbs. In order to secure reliable averages across a large and spotted ore-body the writer has found it necessary to break 25 and even 80 tons for single samples. These extreme quantities, however, were tested by mill-runs. The trench, or groove, is blasted out and afterward trimmed to uniform dimensions. Large samples, exceeding say 300 to 500 lbs., may be received upon the bare floor of a level, but when the bulk is less it is handled on canvas. This is protected from injury by covering with loose plank before blasting.

It greatly facilitates the subsequent reduction of the mass broken down to work upon a smooth surface. Thus, where many samples are to be taken along levels, it is best to lay temporary platforms, made of loose plank, beneath the sample points. A platform may be moved and relaid in ten minutes, and for a heavy piece of work three will do for a working force of one assistant and ten or twelve miners. In taking samples down a shaft or winze, a temporary platform is placed at each

oint. Work done in stopes also requires the use of movable platforms rected in any convenient way.

*Samples from Loose Material.*—In mine examinations it is frequently ecessary to take samples from loose ore, dumps, mill tailings, etc. To btain a sample of ore which is being extracted, one or more shovelfuls re taken out of each bucket, or car, and thrown into a pile to make the ample. In the case of sacked ore, a few pounds are taken from the top f each sack, or when greater accuracy is necessary every second or ourth sack is emptied on the pile. A pile of ore on the dump may be oughly sampled by taking one or more shovelfuls from each one of nany points, distributed at equidistant intervals over its surface. The nly safe method, however, is to drive several open trenches or tunnels hrough the mass, taking, say every tenth shovelful for the sample. For dump of mill tailings, a boring tool is used, made of a 16″ piece of 2″ ipe. This is easily carried to the mine and attached to a handle of onvenient length. The dump is pierced by bore-holes at equidistant ntervals, and the borings from each hole are reduced and assayed eparately.

*Reduction of Samples.*—The reduction of a sample from its original ulk to that of the assayer's package, does not differ in principle from he process followed at sampling and smelting works, but requires less ccuracy. Moreover, instead of using machinery and routine methods, he reduction must be made on the spot by hand, upon samples varying greatly in grade and quantity, and under every disadvantage of nderground conditions, from showers of water to the cramped quarters t the bottom of some narrow hole. Therefore, no two samples are educed in the same manner, and fixed rules are impossible, so that it ecomes necessary to recount with some detail the fundamental principles of the process as applied to underground work. It is not, however, within the purpose of this paper to enter into the many practical details of manipulation, although accuracy in hand reduction depends largely upon skill in these small points.

The process of reduction requires the continual repetition of two consecutive operations. First, crushing to a certain maximum size; second, the impartial selection of a fractional portion of the mass. The latter operation comprises the two consecutive acts of mixing and cutting, these being performed once or several times until the definite fraction desired is obtained.

Whatever final limit of error is permitted for a given sample, it is a rule that at each repetition of this series of operations they must be performed with more care than before. In consequence of this a very large sample requiring many repetitions of the series finally reaches a stage where so much care and accuracy are necessary that handwork is too laborious. At this point the sample, whatever its bulk, should be made up into the final package and sent to the assay office, where crushers, grinders, the buck-board, and fine sieves are available for the final operations. Thus the bulk of the final package is fixed by deciding whether it is better to incur the expense and delay of pushing reduction a step or two further at the mine, or, on the other hand, to bear the cost of transporting a greater weight to the assay office. In practice, the packages generally range between 4 and 10 lbs., and frequently reach 25 and 50 lbs., especially when the assay office is near.

*Crushing.*—The ore is broken so that no lump shall exceed the maximum size decided upon. Very rich lumps are broken smaller in order to distribute their value. During the final stages of reduction a pair of sieves with $\frac{3}{4}$" and $\frac{1}{2}$" meshes are useful to separate out those lumps which require breaking.

*Relation of Maximum Size to Bulk.*—The instinctive judgment derived from long experience in sample reduction is necessary to promptly decide the maximum size and the fraction to be selected at each series of operations. These must be so taken as to keep the work within the limit of error allowable, and at the same time have it move rapidly. Since this relationship of maximum size to bulk depends on several variable conditions, and is never the same for any two samples, it is impossible to illustrate it in a very satisfactory way. The first column of the following table will, however, give an idea of the maximum size selected by general judgment for two typical cases of reduction.

TABLE ILLUSTRATING THE RELATION OF MAXIMUM SIZE TO BULK IN TWO TYPICAL CASES OF HAND REDUCTION.

An average ore is taken, containing $10 to $50 per ton, and it is assumed that the richest lumps of full size do not assay more than five times the above value.

| | Sizes Adopted in Practice. | Theoretical Sizes as Calculated by Reed's Formula. Maximum Size of Lumps. (Diameter in Inches. Allowing a Limit of Error of— | |
|---|---|---|---|
| | | 5% | 10% |
| CASE I. Reduction of an 1,800-lb. sample to 7 lbs. by taking one fourth after each crushing. | | | |
| 1,800 lbs. prepared for reduction by crushing to | 4 in. | 3 in. | 3.8 in. |
| The 450 lbs. prepared by crushing to | 2 | 1.9 | 2.4 |
| The 112 lbs. prepared by crushing to | 1 | 1.2 | 1.5 |
| The 28 lbs. prepared by crushing to | 0.5 | 0.75 | 0.9 |
| And then reduced to 7 lbs. | | | |
| CASE II. Reduction of a 300-lb. sample to 5 lbs. by taking one fourth after each crushing. | | | |
| 300 lbs. prepared for reduction by crushing to | 2.5 | 1.7 | 2.1 |
| The 75 lbs. prepared by crushing to | 1.0 | 1.0 | 1.3 |
| The 19 lbs. prepared by crushing to | 0.5 | 0.6 | 0.8 |
| And then reduced to 5 lbs. | | | |

Reed's formula* is the result of an effort to find a rule which will express mathematically the effect of the aforesaid conditions for any case. It does this in a very satisfactory manner for the accurate work

*Columbia School of Mines Quarterly, 1885, Vol. VI, p. 351.

of sampling and smelting works where the limit of error is 1%, and it is of interest here to compare the above figures, taken from practice, with its theoretical results. The other two columns, therefore, show the sizes calculated from the formula for limits of error of 5% and 10%.

The differences between these and the practical sizes are mainly due to the fact that for hand reduction several of the constants used in Reed's formula change with each repetition of the series of operations. There are also more repetitions than with machine reduction.

### Mixing.

The three following methods of mixing are used in mine work:

1. *Pouring* from one pan into another. This imperfect method is used only in the final stages of reduction, and when it is to be followed by riffle-cutting.

2. *Rolling* in canvas. This is the best method known, and is used whenever the sample is small enough to handle, say under 200 lbs.

3. *Coning.*—The sample is shoveled into a conical pile so as to secure a uniform radial distribution.

The care used in mixing depends on the method of cutting which is to follow. Quartering requires very accurate mixing. It is not necessary for shovel or riffle cutting, but even here the work is improved with little trouble by roughly mixing before each cut.

### Cutting.

Three methods of cutting are used in the reduction of mine samples:

1. *Shovel-Cutting.*—The pile is shoveled over, one shovelful out of a certain number being taken to make the sample. The ratio depends on the bulk and the accuracy required, but may be, say, one in ten for a bulk of over 5 tons, one in three for 1,000 to 2,000 lbs., and one in two for smaller quantities. The latter is the ratio used in most cases, even for larger amounts.

2. *Quartering.*—The pile of ore, thoroughly mixed, symmetrical in shape and with the coarse and fine symmetrically distributed, is flattened and divided into quarters, two of which are taken.

3. *Riffle-Cutting*, or "splitting" on a hand-riffle. The size preferred for most underground work has several parallel troughs 1¼" wide, and the same distance apart, so that it may be used whenever the sample has been crushed small enough to pass this space. Riffle-cutting is the most accurate and generally the most rapid method in use.

*Choice of Cutting Methods.*—Shovel-cutting is specially adapted to a large bulk, but when this becomes small, say 150 lbs., it requires too much labor and skill to insure accuracy, and either of the other methods is used. In the absence of a riffle, the work is finished by quartering, but otherwise the riffle is taken as soon as the lumps are small enough. Quartering is therefore used in the intermediate stage when the bulk is too small for rapid shovel work, but not yet ready for the riffle.

*Assay Office Work.*—The assayer is always instructed as to the crushing size and further reduction of the sample package to the final assay pulp. From his results the assay value of each sample is so calculated as to conform to the plan of cost estimate adopted.

### Samples for Special Purposes.

*Sorting Tests.*—In mines where the ore broken and hoisted must hav its richer portions sorted out to make a marketable product, it is neces sary to determine the percentages of total value and of tonnage, whic are thus available. Sorting tests are made upon the mine samples using those coarsely broken portions which were rejected during th first operations of reduction. These are mixed proportionately to forn a few group samples, and experienced ore-sorters from the neighborhoo are put to work upon them. All the resulting products from sortin each sample are then weighed or measured to determine their relativ weights, and each product reduced to the assay office package. Whe underground sorting is done, the results of this are also determined.

*Mixtures for Analysis.*—Since the market value of smelting or depends largely upon its chemical composition, proportional mixture for analysis are prepared from the final pulp samples of all such ore.

*Metallurgical Tests.*—When metallurgical tests are required, such a those for concentration, free-milling, pan amalgamation, wet processes etc., proportional mixtures are made for the purpose, often out of th rejected portions of the mine samples. In securing mixtures for test on a large scale the difficulties incident to mill-runs are kept in view

### Rejection of Excessive Assays.

Ore-bodies frequently contain occasional streaks or pockets of high grade silver minerals or metallic gold, and a sample here and ther may chance to include one of these, thus giving an assay far above th general average. Since all the samples taken are at best few in propor tion to the mass represented, the error introduced by averaging in such assays may be very great. It is therefore necessary after plotting th assay results to reject such values, and some arbitrary figure, corre sponding to a mean of the next adjoining samples, is substituted fo use in averaging.

### Danger of Mixed Samples.

It is here necessary to call attention to the danger incurred in th practice of uniting a number of samples and assaying the mixture. I is practically impossible to mix in correct proportions, and this plan also fails to furnish the necessary information about the distribution o values and the limits of pay-ore. The results are also liable to seriou error from excessive samples, as explained above.

## THE MEASUREMENT AND ASSAY VALUE OF SECTIONAL AREAS.

### The Determination of Areas in Sight.

All the plane sections which have been selected to serve as the basi of measurement are plotted to scale. The drawing of each sectio includes all workings, measurements, and ore limits shown, togethe with the sample lines and the figures of their length and assay value Upon the section is then sketched that portion of the ore-body which according to judgment, is safely proven by the mine workings within the plane of section, and may therefore be considered "in sight." I

his operation a variety of problems is presented, those commonly occurring being illustrated by the typical cases shown in Figs. I to VII.

In each figure the outer heavy black line shows the actual ore-body. The heavy dotted line is the limit decided upon for the portion in sight. Within the thin black lines are the portions supposed to be pay at the time of measurement, and therefore sampled. The shaded areas show the actual pay-ore as finally fixed by the sample results.

Fig. I is the section of an ordinary vein presented in a level where the entire thickness of the ore-body is visible.

In Fig. III, the actual bounding surface of the body appears at *A B C* and thus indicates the most probable direction to be given to the curved line limit for ore in sight.

In Fig. II, where no boundaries are disclosed and the ore has no definite structure to guide the judgment, the curved line *A B C* is taken.

In Fig. IV the ore-body is an irregular mass whose contents are arranged in streaks or layers definite enough to justify the limit *a b c d*.

Fig. V shows a thick sheet composed of regular layers, in which the limit *a b c d* may be taken if the entire mass is pay-ore, but if it is limited to a few streaks like the two shown, their continuance is less certain and *a b f d* is taken.

In Fig. VI a thick sheet of ore in layers is shown by the single cross-cut *K* in the long level *e f*. In drawing the limit *a b c d e f g h*, it is a matter of experienced judgment how much of the sheet is really proven by this cross-cut, and how great a length may be given to *a b*.

Fig. VII is a similar sheet in which the layer-like structure of the ore-body warrants the limit *a b c d*. When including areas not actually visible, care must be taken that no one is of such excessive value that its possible variations will introduce a serious error into the final total estimate.

### Fixing the Boundaries of Pay Areas.

The actual pay areas, as included within the intended stopes, are determined from the assay values of the samples. Whether these are above or below pay is generally evident from inspection of the values as they appear upon the section drawing, but in many cases it is necessary to make an approximate estimate of cost for each point. As this calculation is sometimes laborious, the most convenient methods are illustrated by the following three special cases.

In all the sections the figures show the sample numbers, and lines indicate the sample cuts. The length of each sample cut in feet or inches, and its assay value in dollars per ton, are also given for each sample.

Taking the ordinary vein shown in Fig. I, it has been found that the ore in place measures 13 cu. ft. per ton and the cost of stoping is $16 per fathom of 36 sq. ft. The sorting tests have shown that one ton of average ore broken yields 0.50 ton of shipping ore, and that this contains 75% of the total value which was in the original ton broken down.* It has also been estimated that the approximate cost of hoisting, sorting, shipping, and smelting will be $12 per ton, figured upon the tonnage of ore broken. The following table is then calculated :

*While the results of sorting vary according to the grade of the ore, and are not the same for any two points in the pay streak, it is nevertheless accurate enough for this purpose to use the average figures.

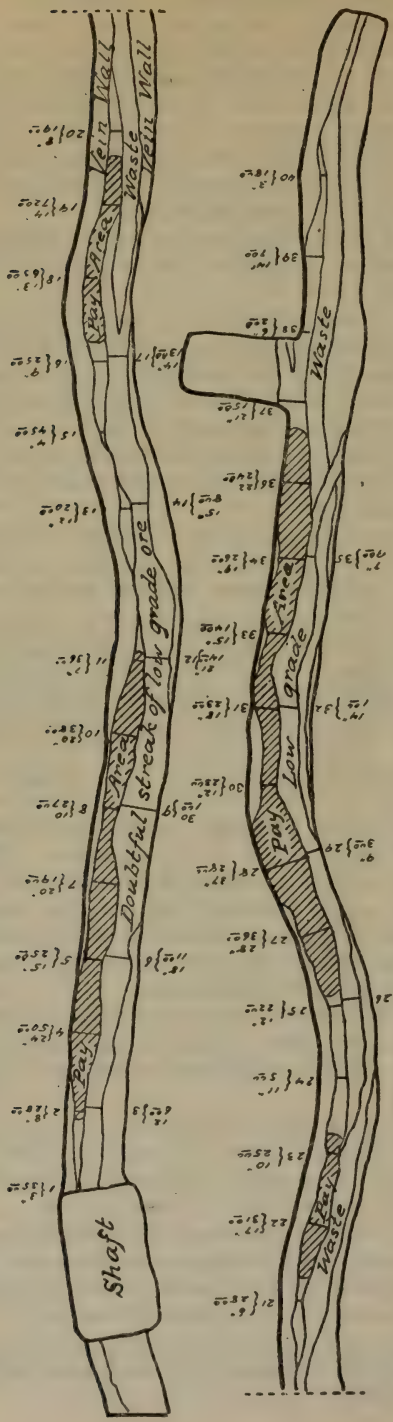



Fig. 1. Section of thin vein exposed in a level.

APPROXIMATE YIELD AND COST OF STOPING PER TON OF ORE BROKEN.

| Thickness of the Pay Streak at the Point Considered. | Tons per Square Fathom of Ore Sheet. | Cost of Stoping per Ton. |
|---|---|---|
| streak 4″ thick yields | 0.92 | $17 33 |
| " 6″ " " | 1.38 | 11 55 |
| " 8″ " " | 1.85 | 8 67 |
| " 10″ " " | 2.31 | 6 93 |
| " 12″ " " | 2.77 | 5 78 |
| " 14″ " " | 3.23 | 4 95 |

Applying these figures to any doubtful sample point such as No. 20, he following estimate is made:

| | |
|---|---|
| Cost of stoping an 8″ streak per ton | $8 67 |
| Cost of hoisting, sorting, shipping, and smelting, per ton of ore broken | 12 00 |
| Total expense | $20 67 |
| Value saved is 75% of the assay value of $19 | 14 25 |

Thus demonstrating that the ore at this point will not pay to extract.

All pay points have been determined and marked; the pay areas which are to be included within the stopes are sketched. (See shaded portions of the figure.) These areas are then measured by scale, or calculated, and the length and average width of each one is also determined.*

In Fig. V the plane of an irregular drift and cross-cut presents a fair cross-section of a wide vein whose structure is in parallel layers. Four of the ore streaks shown have been sampled, but only two of these have proven to be above the pay limit. They are so far apart as to require stoping separately, and are therefore treated as though each one was a distinct vein. The pay areas are fixed as in the previous case, and extended to the limit adopted for ore in sight.

Fig. II illustrates the application of this method to the section of an irregular body of milling ore. It is in this case a more simple matter to compare the assay value of each sample with the total cost of mining and milling, plus the tailings loss, this sum being here taken as $5 per ton.

The pay areas outlined are carried only to the limit previously fixed for ore in sight.

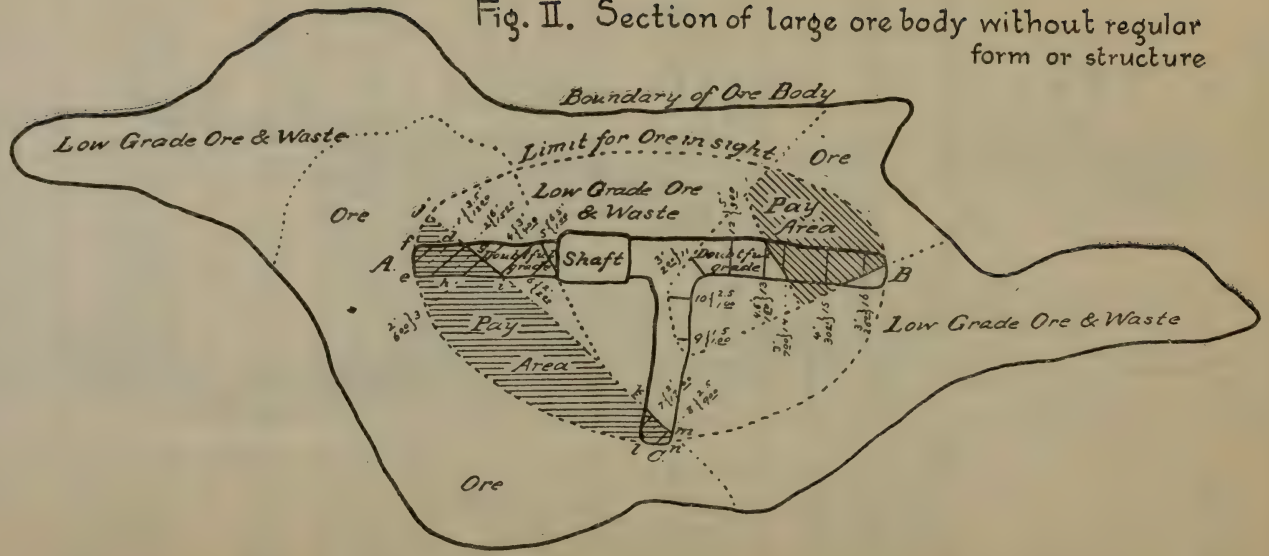
METHODS OF AVERAGING THE SAMPLES.

In each section the value of its pay areas, either singly or jointly, is determined by averaging all the samples within these areas. In doing this each sample is given a weight proportional to that part of the area which it represents.

When uniformly spaced, as in some parts of Fig. I, each sample value

*Of the well-known methods for measuring such areas, the following will generally be found most convenient and rapid for this purpose: A small piece of thin transparent paper is ruled with parallel lines, 2′, 5′, or 10′ apart by scale, as the case may require, and this is placed over the area to be measured. The lengths of the strips thus formed are then measured by a scale.

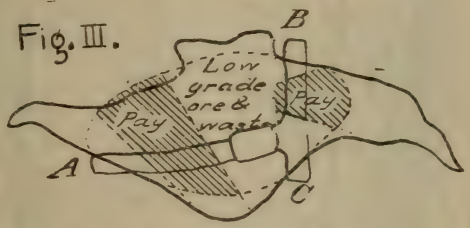
Fig. II. Section of large ore body without regular form or structure



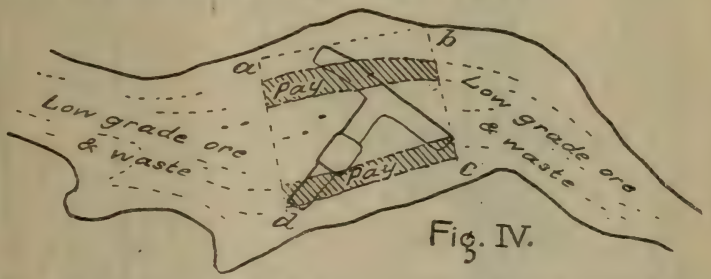
s multiplied by the length of its line and the sum of the products is livided by the sum of these lengths.

When irregularly distributed, it is necessary to sketch by judgment hat portion of the pay area which may be allotted to each sample. In loing this due regard is paid to the structure of the ore, whether homo-geneous, in layers, or otherwise. In every such portion the number of quare feet is then measured and multiplied by the value of its sample. The sum of these products divided by the total area gives its average value.

In Fig. II the pay area *e f j m n l* has been exposed for sampling only at two places, *A* and *C*. The average value of each part thus




exposed, such as *e f d i*, is first determined by letting each sample represent the ore half way to that next adjoining. Sample No. 1, therefore, represents the portion *e f d;* No. 2 represents *e d g h;* and No. 3 represents *h g i*. The average value of part *m n l k* is determined in the same way. The number of square feet in each of these two exposed parts is then multiplied by its average value thus determined, and the sum of both products divided by the sum of both areas. The result is taken as the average value of the unseen part *e i k l*. The part *d j f* is assumed to have the same average value as *e f d i*.




In Fig. V a variation is made from the plan just described because of the layer-like structure and the distance between the exposed places. In the upper pay streak the average value determined as before at each of the two exposed places, *h m l g* and *n q u r*, is assumed to extend half way through the unseen portion to the line *e z*.

Fig. VIII illustrates the use of this method for averaging samples in the section of probable ore exhibited by a vein outcrop. The samples were taken wherever the ore was uncovered, from scattered outcrops and shallow prospect pits. The structure of the vein was very regular, being in uniform layers, so that each sample was assumed to represent the layers cut by it for a distance half way to the next adjoining samples. For instance, the sample line *a d* represents the area *a k l b* + *b i j d* + *c g h d* + *a c f e*.

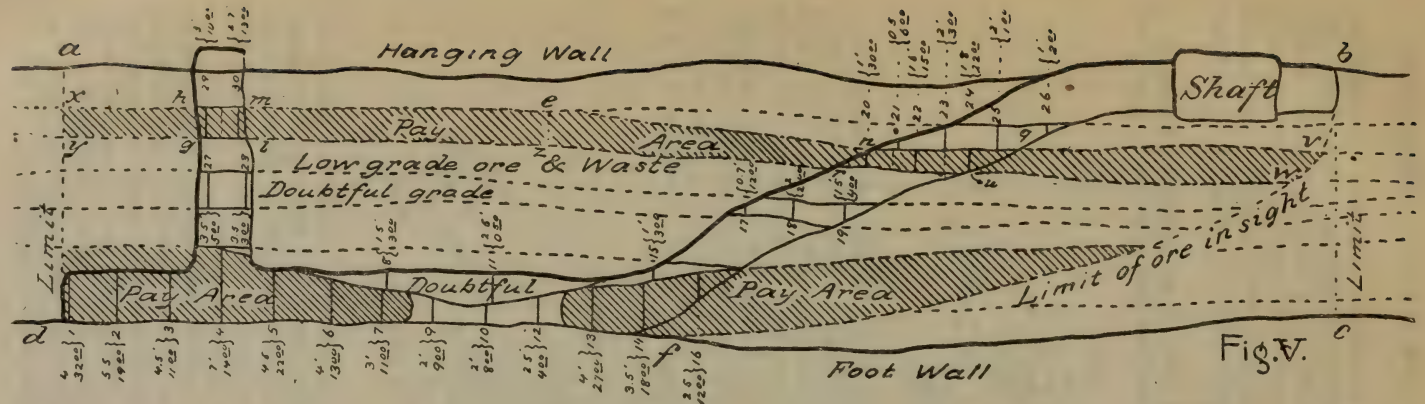



Fig. V.

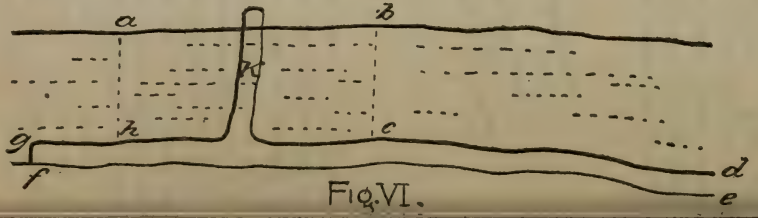



Fig. VI.

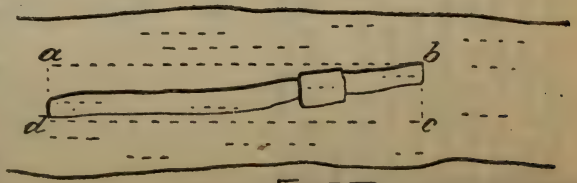



Fig. VII.

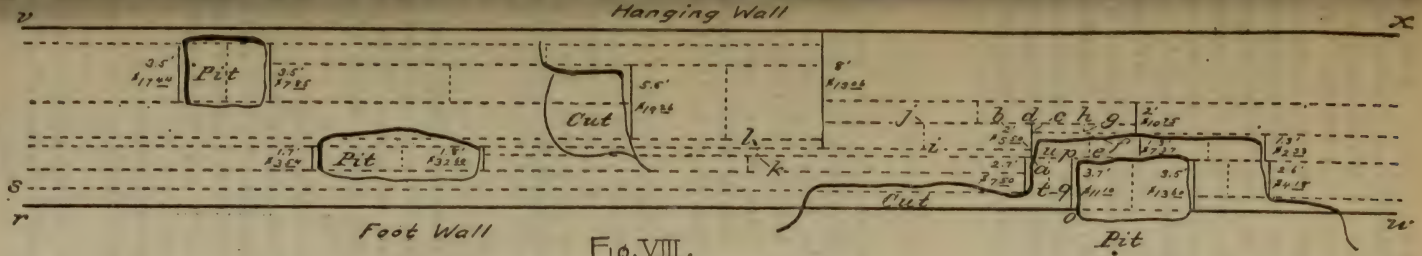



Fig. VIII.

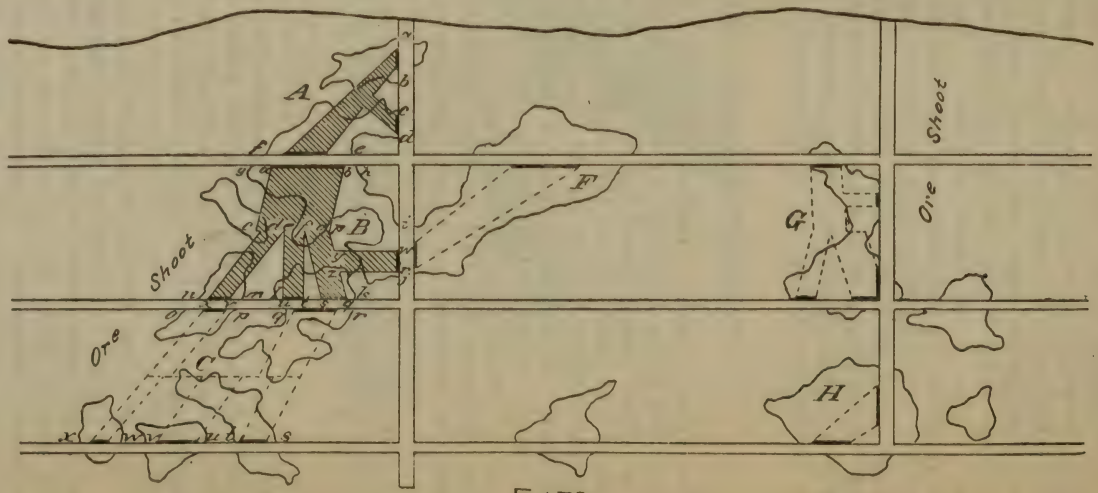



Fig. IX.

It will be noticed that these fractional areas are not all represented with the same degree of probability, and sample *o p*, for instance, is more certain to correctly represent the area *p q t u* than area *o r s q*. This is because the samples could not be uniformly distributed. If it happens for this reason that any areas are not well enough represented for the object in view, they should be excluded. In this case it was sufficient for the purpose to include all parts of the area within *w x v r*.

The same method is used for all special problems of this kind, such as where samples are taken irregularly over a large open quarry of ore or where a mass is pierced by scattered bore-holes, or exposed by test pits. A case of the latter is shown in Fig. XIII, where the thickness and value of the ore-sheet cut by each pit is given by figures. The outer line is the adopted limit within which the ore-body is considered probable, and the dotted lines show the area allotted to each sample point. Each area is multiplied by the ore thickness to give the volume and this is multiplied by its sample value. The sum of the products is then divided by the sum of the volumes.

### THE MEASUREMENT AND ASSAY VALUE OF VOLUMES.

The object of measurement is always to determine the *most probable* volume and value indicated by the sections for the unseen interior of a block. How closely these figures agree with the facts depends on the regularity of structure in the ore-deposit, and also on the proportion between the volume of ore in the block and the area of ore exposed in its sections. Blocks are frequently thrown into "ore probable," because the distance between the two opposite faces is too great for the small amount of ore exposed in them.

The judgment acquired by long experience in the structure of ore deposits is necessary to decide these questions so that the results will have the certainty required for "ore in sight." It is also necessary to judge how much these most probable figures may vary from the truth and apply the safeguards and the factor of safety hereafter mentioned.

#### Ore-Sheets of Ordinary Thickness.

The cases most frequently presented in practice are illustrated by Fig. IX, which is a section on the plane of an ordinary vein whose thickness does not exceed the width of the mine workings. The pay areas determined in the various sections are indicated by heavy black lines.

*Blocks with Two Parallel Sections.*—This case is illustrated by Block *C*. It is treated as a prismoid whose end areas are constituted by the sums of the pay areas in each section. Unless one end area is very much smaller than the other the use of the prismoidal formula is an unnecessary refinement. It is generally sufficient to average end areas and multiply by the perpendicular distance.

The average assay value per ton is obtained by multiplying the average value in each section by its total pay area and dividing the sum of these products by the sum of the areas.

*Blocks with Three Sections.*—Block *B* is of this class, having the sections *n k*, *i j*, *g h*. Two of these sections are often found to be more representative than the third. Its results are therefore sometimes

omitted in whole or in part, and sometimes merely given less weight. When all the sections are used the block is measured by the *method of equivalent figures*.

Taking Block *B* as an illustration, the sections *g h* and *i j* each have one pay area, while section *n k*, which cuts two ore-bodies, chances to expose three pay areas. The number of square feet, average value, actual length, and average width, have been determined for each of the five areas. The purpose is to sketch within the block an average figure assumed of a certain uniform thickness, and of such shape that it will be the most probable equivalent of the pay-ore included in the actual stopes.

The uniform thickness adopted for this purpose is the average thickness of the pay-ore, which is found by adding the five pay areas and dividing by the sum of the five lengths. Each pay area is now divided by this uniform thickness, giving the length of an equivalent area, and these *assumed lengths* are plotted to scale in their average positions. (See lines *a b*, *w r*, *q s*, *t u*, *v x*.)

Fig. X.

The equivalent figure shown by the shaded portions of the block is now sketched from these lines. In doing this due regard is given to the indicated structure, the object being to place the figure in the position probably occupied by the assemblage of pay portions. Assuming that in this block the main shoot evidently passes from *a b* to *x q*, the figure is drawn symmetrically between them, allowing each area to represent conditions half way through the block. The area *w r* thus appears to be a side projection, and the figure *w r z y* is drawn from it to meet the main figure at the nearest point. The area of the entire figure is then measured by scale and multiplied by the uniform thickness. Block *G* illustrates a similar case.

Fig. X shows Block *B* when the structure indicates that one or more bodies extend between sections *i j* and *k l*. This gives two equivalent figures, *a b v x* and *w r q s e t u*, or it may be treated as a combination of the simple cases under I and III.

In the method of equivalent figures, the average value is determined by multiplying the value of each pay area by that portion of the total volume which it represents. The sum of the products is then divided by the total volume.

*Blocks with Two Perpendicular Sections.*—In the simple case illustrated by Fig. XII the pay area in each section is converted to an equivalent

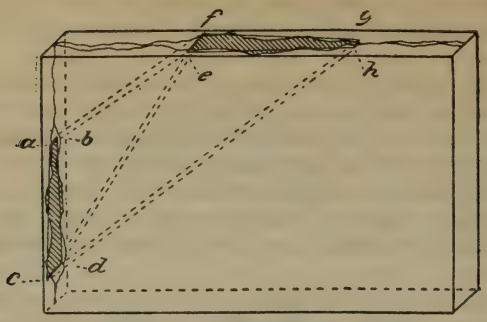



Fig. XI.

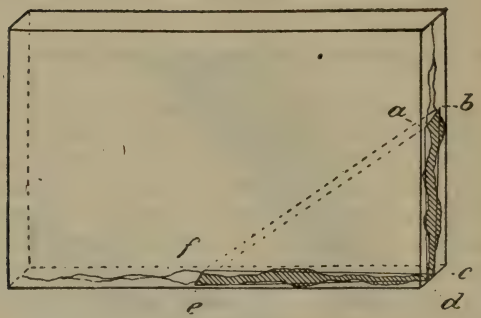



Fig. XII.

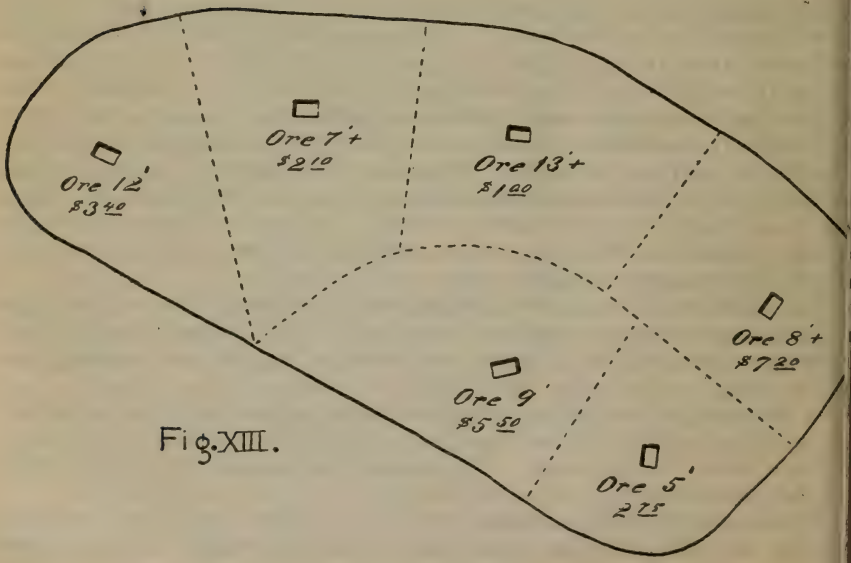



Fig. XIII.

rapezoid like *a b c d*, whose shape conforms as closely as possible to the verage actual shape of the pay streak by having the same length and by being wider at one end than the other, if necessary. The ends *a b* and *d* are parallel. The two trapezoids are sides of an irregular wedge to which the prismoidal formula is applied.

Fig. XI shows in perspective the case of Block *F*, Fig. IX. Here the areas are also converted to equivalent trapezoids, and the figure cut into wedges by the intersecting plane *c d f e*. Blocks *A* and *H*, Fig. IX, also illustrate this case, the method of equivalent figures being used for Block *A*.

In wedge measurements the average value is calculated by multiplying the total pay area of each section by its value and dividing the sum of the products by the sum of the areas.

### Ore-Deposits of Other Forms.

In irregular bodies blocks are usually found with two parallel sections, but at times peculiar and more difficult problems are presented. The section planes are occasionally at an acute angle to each other, and while the method of case III will generally apply, no rule can be given when each section shows several irregular pay areas. For such problems special expedients may always be devised. Masses cut by test pits or bore-holes have their volume measured as explained by Fig. XIII.

In practice, blocks are often found with their contents partly stoped out, offering problems more complicated than the typical cases described. Additional planes of section are usually afforded by such stopes, and it is generally necessary to divide the block contents into several parts, each of which is measured separately. In such cases there is no difficulty in applying the principles already illustrated.

### Rapid Approximate Methods, Dumps, Etc.

Rapid approximate methods are frequently used for preliminary estimates, or to check the results of detailed measurement and sampling, or to determine probable ore, or in estimating the chances for further discoveries, etc.

Sometimes the contents of an ore shoot or body are estimated from the average yield per unit of area or length of other portions already worked.

Again, a continuous sheet of ore is sometimes so intersected by mine workings as to expose and prove the sheet within the area bounded by a line circumscribed about these workings. It may then be unnecessary for the purpose in view to estimate each block separately. The entire area which is considered proven is measured as a whole, and the number of square feet of vein area excavated by the workings is also measured and deducted. From the total yield of the area already worked, that of the remaining portion may be calculated.

When this quick method is applied with judgment to the proper conditions, and the actual figures of production are known with *certainty*, its results agree very closely with those of detailed measurement and sampling, and are often used to check them.

Dumps are measured by ordinary cross-sections, but since they are generally on an inclined hillside, it is not always convenient to measure from the horizontal base plane of an instrument. A string or line of

sight between two poles is often preferred, and is accurate enough for the purpose. Irregular sections are always plotted.

### THE REDUCTION OF VOLUME TO TONNAGE.

This is done by using the factor of cubic feet per ton for the ore in question. This factor is derived in two ways:

#### I. By Calculation from the Specific Gravities of the Minerals.

This method is applicable only to ore composed of simple minerals or simple rocks or their combinations in known proportions. A safe margin is always added to the theoretical result, because the standard specific gravities given are the figures for pure, dense crystallized specimens, while in ore-deposits the minerals are often more or less altered and somewhat amorphous and porous.

The following table gives the calculated figures for these minerals and rocks of which ores of the precious metals are mainly composed. The first column is the theoretical result, calculated from the average specific gravity, and the second gives a general figure for practical use.

Figures thus assumed from calculation are always applied with much caution and judgment, because when rocks are so impregnated as to become ores they are generally full of small fractures, and may be spongy or porous. The figures for practical use are calculated from the minimum specific gravities given by the authorities, with an addition of about 5% for variations, crevices, cavities, etc.

Number of Cubic Feet per Ton.

| Material. | Number of Cubic Feet of Solid Material in Place, Per Ton of 2,000 pounds. | |
|---|---|---|
| | Theoretical Figure Calculated from the Average Specific Gravity. (For Pure Unaltered Specimens.) | A Figure for Practical Use. |
| Galena | 4.3 cu. ft. | 4.7 cu. ft. |
| Pyrite | 6.4 " " | 7.0 " " |
| Blende | 8.0 " " | 8.5 " " |
| Hematite | 6.6 " " | 7.5 " " |
| Limonite | 8.4 " " | 9.4 " " |
| Dolomite | 11.4 " " | 12.5 " " |
| Limestone, Andesite, Syenite | 11.9 " " | 13.0 " " |
| Vein Quartz, Granite, and Granitic Rocks | 11.9 " " | 13.5 " " |
| Clay, Quartz, Porphyry, Trachytes, Rhyolites, etc. | 12.3 " " | 14.5 " " |
| Vein Quartz with 15% Galena | 10.7 " " | 12.2 " " |
| Vein Quartz with 15% Pyrites | 11.1 " " | 12.5 " " |
| Vein Quartz with 10% Hematite | 11.4 " " | 12.9 " " |

#### II. By Practical Tests.

Oxidized ores are generally amorphous, loose, and porous, and cannot be calculated. Their volume is therefore determined by practical tests by any of the following methods:

In a thin sheet the ore may be stripped and several tons broken down

and weighed, after carefully measuring the thickness and area broken to determine its volume.

In a mass of ore the writer has used the figure obtained by carefully stoping the right rectangular prism to be filled by one "square set" of timbers.

The determination is made on a small scale by filling a bucket, tub, or box of measured volume with weighed, coarsely broken ore, and then pouring in water, level with the top of the ore. The total volume occupied is then measured, the water is poured off and its volume measured; the difference being the volume of the solid ore. Occasional determinations of this kind on various ores soon make it possible to select a safe factor in most cases by judgment, since the principal object is not scientific accuracy, but safety.

Loose ore piled on dumps in pieces from head to gravel size will have from 35% to 50% of interstitial spaces, the percentage being greatest if the lumps are somewhat equal sized. Thus a dump with 40% of spaces, and composed of ore averaging 12.7 cu. ft. per ton in place, will measure 21.2 cu. ft. per ton.

## ESTIMATE OF THE TOTAL NET VALUE.

The net profit, or *net value*, of the ore measured and sampled is generally figured by the ton, either by a separate calculation for each individual block, ore body, or shoot, or by one calculation for the entire mine. Conditions are generally uniform enough for the latter plan. The tonnage of ore measured is only what will be actually broken down. The sample assays represent this measured ore as it will be when broken, and before it is sorted, either under or above ground.

The methods of calculating the net value of this ore from these data vary with every case, but their details are not of interest here. It is, however, necessary to call attention to the four principal factors which usually enter the problem, and the variations in calculating each factor.

THE FOUR PRINCIPAL FACTORS COMMONLY USED IN MAKING ESTIMATES OF TOTAL NET VALUE.

| | |
|---|---|
| I. *Gross or Assay Value* per ton. This is always figured on the "ore broken," and from the assays and analyses. It is either: | 1. *Full Value*, according to N. Y. quotations for the valuable metals contained.<br>2. *Partial Value*, with various losses, expenses, and deductions subtracted here. |
| NOTE.—The assay value of various products from the ore broken is often required, such as: (This is determined by calculation or by special tests.) | 1. *Ore Milled* (after some sorting).<br>2. *Sorted ore shipped.*<br>3. *Concentrates.* |
| II. *Losses* (to be deducted from the assay value) are either expressed per ton, or as a percentage of the "assay value." They comprise either: | 1. *All the losses.*<br>2. *Part of the losses*, the remainder being placed in I or IV. |

| | |
|---|---|
| III. *Tonnage* used is either: | 1. *Ore measured* = ore broken.<br>2. *Ore hoisted* = the ore broken; often after it has been reduced somewhat by underground sorting.<br>3. *Ore shipped* = the ore hoisted, generally after it has been further reduced by sorting on the surface.<br>4. *Ore milled* = either the ore hoisted, or this reduced by further sorting. |
| IV. *Cost* per ton may be figured on either of the above tonnages or on that of the products, such as concentrates, etc.<br>It includes both: | 1. *Cost of Mining:* Including general expenses and "development" only so far as they are required for extraction of the blocked ore "in sight."<br>2. *Transportation and Treatment.* Some of the losses and smelter deductions from assay value are often included here. |

It is to be noted that each one of these four terms is meaningless unless accompanied by a full explanation of how it is figured.

In estimating losses on milling ores it is not often safe to deduct a given percentage, but the loss should be expressed by a definite number of dollars per ton. The reason for this is that the loss in such ores is generally quite constant, and bears little or no relation to their original contents.

## SAFEGUARDS AND FACTORS OF SAFETY.

Throughout the work the following principles are kept in view:

The accuracy with which a sample is made to represent its line should be somewhat proportioned to that with which this line represents its area, and the area its volume. At the same time, since the limit of error in the sample is controllable, it is kept much less than the possible errors of area and volume, which are fixed by the conditions of the mine.

The possible error in the estimate of a block must be provided for in one of two ways. If there are a number of blocks not differing greatly in value their errors will balance according to the probability of averages. If there are but few blocks, or the value of some one is so great that its possible error will be a large percentage of the final total estimate, a safety deduction is made to cover this possible error. The necessity for this deduction and its amount are matters for experienced judgment. Probably every one engaged in this work has had occasion to notice the danger in an estimate of ore in sight, based upon a single block, the variations of which are not balanced, and in this case a liberal deduction is often necessary for safety.

Fraud in some form, generally from salting samples, is a danger often possible, and every engineer devises his own private system of safeguards, but no system can do away with the necessity for constant care and vigilance.

# COMSTOCK ORE-SAMPLING.

By John S. McGillivray.

Written for the "Mining and Scientific Press," February 29, 1896.

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The rehearing, before Judge Hebbard, of part of the Hale & Norcross case, furnishes, in the evidence offered, some valuable lessons to miners, not only on the Comstock, but everywhere. Judge Hebbard had found, in the first trial of the case, that the Hale & Norcross sustained damage by the imperfect milling of the ores in the amount of $789,618. He held that the amount returned by the mills in bullion was 52.11%, and that it should have been at least 75% of the car sample assays.

The Supreme Court was not satisfied with the evidence upon which he had based his conclusions, and sent this part back for rehearing. In the rehearing the subject of ore-sampling, and of the methods of milling on the Comstock—as to the evils and the causes of them—was gone over by the best of practical miners and experts, and many points of interest were brought out.

Louis Janin, the well-known mining engineer, was called as an expert witness in the case. Mr. Janin has had many years' experience in mining and milling on the Comstock, and is thoroughly familiar with all the methods of mining in vogue there. So, on the stand, he went over practically the whole ground in dispute. Aside from its bearing on the case, much that he said is worth the attention of miners. What follows in this article is made up from his evidence, as given on the trial, from data furnished by him to the writer, and from authorities he used for reference while on the stand.

As to the sampling itself, upon which the case mainly hinges, it was shown that a very careless system has been in vogue on the Comstock ever since the beginning of mining there. Correct assaying of ores is the main check by which millions are guarded wherever mining is done, and if assaying is to be of any value at all, careful and correct sampling must be done. Professor Christy, of the College of Mines of the State University, in a paper published by the American Institute of Mining Engineers, says of this:

"Haphazard and occasional sampling and assaying are worse than useless. They lead to great losses of valuable capital, frequently to the total abandonment of good properties, and, worse than all, to a false sense of self-satisfaction, that discourages improvement by denying its necessity."

By sampling is understood the final delivery to the assayer of a comparatively small proportion of ore, which accurately represents a very much larger volume of the same material. That is to say, in proportion to its quantity, it will contain precisely as much, or as little, of the gold and silver as a ton will of the rock sampled. The greater the proportion that is taken of the ore-body, the more likely it is that it

will represent an average value. Ordinarily, metallurgical works which treat ore from many sources, or buy ore from many different people, pay for the ore on the assay value. The proportion that is taken for a sample of the total amount is one tenth or one twentieth of the lot; or, if the lot itself is small, say ten tons or under, the whole amount. This proportion that they thus select, is crushed fine and thoroughly intermixed.

On the Comstock, a grab sample is taken from the carload of ore, which is not thoroughly mixed, and the pieces of which are very far from being uniform in size, and instead of one tenth or one twentieth of the lot, the amount grabbed is probably not over half a pound from the carload, which weighs nearly a ton. In one case one part in 10, at least, is taken, and in the other, one part in 4,000. Moreover, in the former case, the whole lot is crushed, to permit of uniform mixture; but on the Comstock only about 8 lbs. of the day's samples, of say 100 lbs., are taken from the sample-box, and that, too, without crushing or quartering down, for the assayer; in other words, the assayer takes his assay from one part in 48,000.

The manner in which the carman takes the sample from the carload of ore, weighing about a ton, is necessarily incorrect, for the carload itself is not an intimate mixture, which is required in good sampling, and the quantity that he takes, as stated, is but one part in 4,000. If, during the twenty-four hours, he has thus taken, say from 100 cars or 200, or whatever the number may be, the final result is the same small proportion of the total amount which he is supposed to be sampling. Nothing can be properly sampled which is not homogeneous, unless one gets a proper proportion of each component part.

In these ore cars the ore is generally in a finely divided state, but the waste rock is coarse. No man being asked to sample ore will take one or two pieces of the coarse as representing the mass, for he knows that it is not ore; he cannot help knowing it, and it is not in human nature for him to grab up masses of waste rock when he is told to sample ore; he only does it in cases where it is intimately intermixed, so that he does not know one from the other.

The manner in which the sample for the assayer is prepared is also incorrect, also supposing that there are considerably more than 8 lbs. in the box. A correct sample of the whole quantity which is in the box can only be obtained when the whole amount is reduced to powder, or, at least, in small pieces which will permit intimate inter-mixture. But 8 lbs. out of, say, 100 lbs. would be sufficient if the ore was in a proper mechanical condition, as stated. But in the manner in which this sample of 8 lbs. is taken from the box, the same errors may creep in as in taking the sample from the carloads, possibly even greater. It is true that a man, having 100 lbs. properly spread out, might sort out a closer proportion of poor and rich ore than the car-sampler did, but, as stated, it is a vicious sampling of a vicious sample, and no subsequent result obtained from an assay, no matter how made or how correct, can be depended on as showing the value of the ore-body which it is attempted to sample.

It may be said here that most of the milling on the Comstock is done by custom mills, and this makes it necessary for the mine-owners to take samples before the ore reaches the mill. The millman, for his guidance, takes samples from the pulp as it comes from the batteries.

In most cases throughout California and Nevada, where the mill and mine are under one ownership, assays are made only from the battery pulp. That the mill sample on the Comstock is far better than the haphazard car sample may be easily seen. The ore is broken down in the mine, thrown down an ore-chute, put in the cars, goes to the ore-bin at the mine, then to the ore-cars of the railroad, and finally is dumped into the ore-bins at the mill, where it is broken up by the rock-breakers before it goes to the batteries. In all this handling the ore necessarily becomes thoroughly mixed.

An analysis of the assay value by railroad and battery samples compared with the bullion returns on the lot of 338.72 tons of Hale & Norcross ore worked at the Brunswick mill in October, 1895, furnished an illustration of the unreliability of samples, even of battery samples, if improperly taken. While there was extracted of the silver in the ore 66.01% by railroad sample and 73% by battery sample, there was obtained in the bullion of gold 140% by railroad sample and 153.45% by battery sample. The impossible per cent of yield of gold, even from the railroad sample, will bar one from claiming that the battery sample was too low in gold on account of the gold remaining in the mortar until the final clean-up.

The excessive percentage is due, possibly, to incorrect assay returns. The foreman of the mine testified that the ore was of a different character from what is found elsewhere in the mine, and probably contained a larger proportion of gold to silver than ordinary ore. It is well known that when ore contains free gold, large discrepancies may occur in duplicate assays from the same finely powdered pulp.

One of the main discussions before Judge Hebbard was as to the different percentage of bullion obtained from the ore of different mines and even of different ore-bodies in the same mine on the basis of the car sample and battery sample assays. An erroneous impression was given to many that this was due to the milling, while in fact it was due mainly to the difference in the relative proportion of gold to silver in the ores and to the difference in the minerals comprised in the ores.

It is more difficult to obtain a high percentage from silver ores than from gold ores, the latter being free and uniting quickly with quicksilver, whereas silver is combined with sulphur and other substances and must be first reduced by chemicals before it will unite with quicksilver, and the gangue of the ore often acts upon the chemicals used, destroying their efficacy. In some of the mines the bullion consists of one third gold and two thirds silver, whereas in others the proportion is reversed; in some cases even 80% being gold. Therefore, the per cent of extraction of gold and silver may be equal, but the total percentage will vary. From 80% to 90% should be obtained of the gold and about 45% of the silver in ordinary work on the Comstock.

To illustrate this, take one-ton samples of $40 rock from two Comstock mines, one with 80% of gold and 20% of silver, and the other 30% of gold and 70% of silver. Suppose that in working them there is obtained in each case 80% of the gold and 45% of the silver. From the first lot, containing $32 in gold and $8 in silver, we would obtain $25 60 in gold and $3 60 in silver, or a total of $29 20, which is 72% of the $40. From the second lot we would obtain $9 60 in gold and $12 60 in silver, or a total of $22 20, which would only be 54% of the $40 in that ore. This

accounts for the different percentages obtained in the yield from different mills from working ore from different bonanzas.

In the Comstock there were different bonanzas, or ore-bodies, which differed as to the gangue as well as to the minerals composing the ore. The presence of rebellious metals and the difference in the mechanical condition of the ore-bodies make it almost impossible to foretell closely what the yield in per cent will be from any given ore-body in comparison with any other ore-body, or even, sometimes, of different portions of the same ore-body.

This may be illustrated by the results obtained by Mr. Janin from two lots of slimes worked by him on the Comstock and referred to by Raymond in his "Mineral Resources for 1872." From one lot the percentage of gold extracted was 23.30 and of silver 35.68. From the other lot he obtained 76.28% of the gold and 87.06% of the silver.

It may be interesting to note here some of the points in Judge Hebbard's decision upon which the case was sent back for rehearing.

There were delivered to mill by the Hale & Norcross, 88,887 tons gross weight. Based on this weight the gross value of the ore was $3,505,361, or an average assay value of $39 43 per ton by car sample. Allowing for 6% moisture, there were only 83,553.78 tons dry weight, which, at $39 43 per ton, gives a gross value of $3,294,525. The yield in bullion, based on wet weight, was 52.11% of the gross value by car sample; based on dry weight, it was 55.45% of the assay value. The estimated value of the dry ore by car sample being $3,294,525, and allowing that 5% of the value went off in slimes (the per cent of weight going off in slimes would have been greater, but the slimes are usually poorer, especially in gold, than the original ore), there went into the pans ore containing $3,129,798.

Judge Hebbard decides that there should have been returned in bullion $2,616,491. To obtain this would have required an extraction in the pans of 83.6% of the car sample assay, which he admits the testimony showed to be always too high.

Supposing the car sample assay of the Hale & Norcross ore to have been $5 too high, and Judge Beatty also says that the testimony shows that they are always too high (referring to Mackay's testimony that they usually run from $8 to $10 per ton above the real value), and consequently that the real value per ton was $34 43; then the gross value of dry ore would have been 83,553 tons at $34 43, or $2,876,729. Allowing that 5% of this value ran off in slimes, there would have gone into the pans ore assaying $2,732,892, and the $2,616,491 which Judge Hebbard says should have been returned in bullion, would have required an extraction of 95% in the pans. Judge Beatty assumes that Judge Hebbard has roughly included the yield of the slimes and concentrates, etc., in what should have been the bullion yield. This, however, would still make necessary an extraction of over 90% in the pans, or there would have to be credited to the mill the cost of reworking the slimes, tailings, etc., which would not be covered by the charge of $4 50 per ton allowed as the actual cost of working the ore.

It is necessary for the Comstock millman to extract in bullion at least 75% of the battery assay to make good his guarantee of 65% on wet ore, and allow for loss of slimes. Ore is now worked to a higher percentage on the Comstock than was formerly the case, and it is the custom to grind much longer.

The improvement of the working of Comstock ores lies in the direction of working directly the whole amount of ore as it comes from the battery without separating the slimes, and on accomplishing to a great extent by chemical means what is now less perfectly effected by prolonged grinding of the ore at an unnecessary expense for fuel, castings, and quicksilver, the consumption of the latter being increased by the continuous grinding in the pan.

A better system of sampling is now especially desirable on the Comstock, on account of the working of lower grades of ore, where a slight error may entail a loss by causing the milling of ores that will not pay. It is said that Mr. Keating proposes to put up mills to handle large quantities of this class of ores down on the Carson River as soon as the Hale & Norcross suit is settled. When working low-grade ores the mine-owners must necessarily be very careful, for fear of sending to the mill any that will not pay, for the margin between profit and loss is small.

A charge made in the Hale & Norcross case, and one that has too often been made before, is that of causing a great deal of ore that would not yield a profit to the mines to go through the mills simply for the sake of the milling profits.

When thorough, reliable sampling is done, the mill-owners will be satisfied, the mining stockholders will be satisfied, and a blot will be removed from the escutcheon of the mill-barons of the Comstock.

The remedy is simple and at hand, and only awaits adoption by those in power on the Comstock. Mechanical samplers have been so perfected that their use has given entire satisfaction in other districts, both to the mine-owners and the mill-owners where custom work is done. The rapidity with which ore is extracted on the Comstock precludes the idea of hand-sampling. There need be no objection, however, to mechanical samplers, which can handle any number of tons. These could be conveniently placed at the mine under crushers above separate ore-bins, and a given proportion of the ore delivered in cars might be run to the crushers. Falling thence the ore might pass through the samplers, which can be arranged to deliver any percentage required of all the mass passing through them. For instance, ten carloads out of every hundred might be delivered to the crusher, and all of this would pass through the mechanical ore-sampler, which would deliver as small a lot as desired—say half a ton—the other nine and one half tons going on to the mill. From the smaller lot quartered down the assayer would take his sample.

# A WATER-POWER AND COMPRESSED-AIR TRANSMISSION PLANT FOR THE NORTH STAR MINING COMPANY, GRASS VALLEY, CAL.

By Arthur De Wint Foote, M. Am. Soc. C. E.

Presented at the Annual Convention, 1896, of American Society of Civil Engineers.

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Upon the prohibition of hydraulic mining by the State of California, the immense canal systems extending over the western slopes of the Sierra Nevadas were left without a purpose, and their future existence depended upon a new use for water. Out of this necessity has grown a business of selling water for power and irrigation, retaining the original methods of delivery at the bank of the canal and miner's inch measurement. The price of water is approximately 1 cent per 1,000 gals. delivered at the canal; its cost for power depends upon the pressure that can be obtained from it. In the case of the North Star plant, it could have been conveyed directly to the mines and have done its work there on different wheels more or less adapted to the varying conditions; but there is a certain inconvenience and danger in using water in this manner under a high pressure, and, moreover, the mines are on a hill. So it therefore seemed advisable to convey the water directly to the lowest convenient point, obtain the power there, and transmit this power to the places where it was needed.

This brought forward the subject of transmission of power, and electricity was naturally suggested first. Visits to mines in operation and careful study and investigation of electrical appliances for underground work, especially pumping, finally decided the author in favor of compressed air. The latter method, under the conditions, was believed to be most economical of power, least liable to accident, and cheapest in first cost. Moreover, almost absolute security against stoppage could be obtained by having a set of boilers on hand ready for firing up in case the water-power or air-plant gave out, for, by the use of these boilers and opening and shutting a few valves, all the air-motors become equally good steam-motors; whereas, with electrical transmission an entire set of steam-motors would have to be provided to give equal security; or, as the air- and steam-motors are the same, the electrical-motors would require just so much extra expense in cost of plant of equal security against stoppage.

To give as briefly as possible a distinct idea of this work, a concise description of the whole plant is first submitted, followed by the detailed presentation of its several parts, and finally, the results obtained after careful tests during three months of actual working.

The water-supply is obtained from the South Yuba Water Co., at a point on their canal about 4 miles from Grass Valley, Nevada County, Cal. Thence it is conveyed about $2\frac{1}{2}$ miles to the Empire Mining Co.'s works in a 22″ riveted iron pipe, built more than ten

Compressor House, North Star Mine.

years ago. The new conduit is a riveted steel pipe, 20″ diameter, joined to the lower end of this old one under a head of 420′ and continues 7,070′ to the power-house, situated at the lowest convenient point on Wolf Creek, just below the town of Grass Valley, where a head of 775′, or a static pressure of 335 lbs. per square inch, is obtained. The capacity of this pipe is sufficient to develop 800 to 1,000 H.P.

At the power-house there is a Pelton water-wheel 18′ 6″ diameter, running on a 10″ shaft, to which a duplex compound air-compressor is connected directly. The initial cylinders are 18″, and the second cylinders are 10″ in diameter, with a 24″ stroke. They were designed to run at 110 revolutions per minute, and require 283 H.P. from the water-wheel.

A 6″ lap-welded pipe conveys the air at 90 lbs. pressure from the power-house to the company's Stockbridge shaft on Massachusetts Hill, 800′ distant and 125′ higher. Here it is now being used in a 100 H.P. cross-compound Corliss pneumatic hoisting engine, and a 75 H.P. compound pump, besides other pumps, blacksmith forge, drills, etc.

*The Pipe-Line.*—The line of the pipe is quite crooked, both horizontally and vertically, partly because it was necessary in locating it to follow a county road. The trench was dug with plows and scrapers, except where too stony, and the joint holes were dug by hand. The joint holes cost fully as much as the trench, for the reason that many of them reached down to the harder and rockier stratum below the soft surface material. The trench was about 10′ wide on top, 4′ to 5′ on the bottom, and 4′ deep. The joint holes were 4′ to 5′ long and 3′ deeper than the trench. The total cost of all the work of burying the pipe, including covering a large portion of it with stone from the mine dumps, and cement masonry wells for the valves and for sustaining the pipes around bends, amounted to approximately $6,756 27. This was done on company account, after refusing bids, the lowest of which would have amounted to about $8,500.

An aqueduct of cement masonry across Wolf Creek at the power-house is not included in this estimate, but was built on company account. It was first built up to grade; the pipe was then laid upon it and afterward covered, so that the pipe is now in the center at the tops of the arches, where the masonry section is 4′ square. The piers of this aqueduct are carried down to the bedrock of the creek some 8′ or 10′ below its water-level. The lower portion of the center piers was built up of cement concrete, but the remainder of the bridge is built of the rough stone hauled from the mine dumps in the vicinity, and Portland cement and sand mixed one to three. Very little hammering was allowed, mortar being cheaper than masons. The center arches are of 33′ span, and the other two of 24′ and 28′; the length of aqueduct over all being 153′. The rock and sand each cost 75 cents per yard delivered; common labor, $2 50 per day; masons and foreman, $4 per day. The entire cost of the bridge was $1,435; as it contains about 180 cu. yds., the cost per yard was about $8. It is thought that this will prove cheaper in a few years than any other mode of carrying the pipe across the creek. Wood or even iron would be subject to more or less change of form, sufficient to cause leakage in the pipe, but it is believed that the pipe buried in the masonry, when once tight, will never have movement enough to cause leakage. In any case, it is probable that a wooden

truss bridge with stone piers would have cost nearly as much as the stone. It should be mentioned, however, that the lumber for centers is not included in the cost in this case as it could be used equally as well afterward in the mine.

The steel slabs for the pipe were furnished by the Pennsylvania Steel Company. The Central Mills of Harrisburg rolled the plates, and only seven sheets of the entire lot were rejected by the inspector. The Risdon Iron and Locomotive Works of San Francisco manufactured the pipe from the 48″x 66″ sheets and laid it complete in lengths of about 28′ in the trench under the following schedule, the longitudinal seams being double riveted by hydraulic riveters:

| Head. | Length. | No. B. W. G. | Thickness. | Rivets. | Remarks. |
|---|---|---|---|---|---|
| 420′ to 500′ | 2,320′ | 9 | 0.148″ | $\frac{3}{8}$″ | Cold riveted. |
| 500′ to 600′ | 2,110′ 6″ | 8 | 0.165″ | $\frac{3}{8}$″ | " " |
| 600′ to 700′ | 1,158′ | 7 | 0.180″ | $\frac{7}{16}$″ | " " |
| 700′ to 750′ | 1,204′ | 6 | 0.203″ | $\frac{1}{2}$″ | Hot riveted. |
| 750′ to 775′ | 285′ | 5 | 0.220″ | $\frac{1}{2}$″ | " " |
| Receiver. | 40′ | --- | 0.375″ | $\frac{5}{16}$″ | " " |

The specifications required a mild and very tough steel, and the cold flat bending test was insisted upon for all thicknesses. The pipe was dipped, after being made into lengths, into the usual hot asphaltum mixture, and then shipped by rail to Grass Valley and delivered along the trench in wagons. It was then rolled into the trench, and the lengths riveted together in place. Where there was no change in direction a slip joint was made by raising the outer end of the length with a small hand derrick, slipping the upper side into the completed portion, and catching it there through the rivet holes with bolts. Then by lowering the outer end, the weight forced the length into its place with a little care and guidance by chisels, when it was bolted ready for the riveters. Where there was a change in direction, bands were put on in two halves, lapping, but no bend piece or band was allowed with more than 4″ difference in width between the inside and outside. Where hot rivets were used a $\frac{3}{4}$″ hole was punched in the top of the pipe near the end, through which the hot rivets were dropped to the holder-on inside. This hole was afterward stopped with a $\frac{3}{4}$″ gas-pipe plug. P. & B. paint was used to cover all points not protected by the original asphaltum mixture, because it was considered preferable to the hot mixture when put on the cold metal.

In filling the pipe with water, it was quite a delicate operation to let on the full pressure at the Empire gate, as it added 180 lbs. pressure per square inch the instant the lower 7,000′ became full. It was done several times by keeping open a valve at the lower end of the pipe, while the Empire gate was allowing a little more to pass than the lower valve allowed to run away. In this way the pressure was not raised more than 10 or 15 lbs. above the normal. Numerous very small leaks appeared in the pipe under pressure, but neither then nor since has there been a defective rivet or plate. Fine dust from the wagon road was put into the pipe in considerable quantities, which stopped most of the smaller leaks or sweating. The attempt was made at first to mark the larger leaks, and then take off the pressure and calk them, as in the

case of a steam boiler. It was soon found, however, that they would appear again as soon as the pressure was returned. Since the leaks have been calked under pressure, using proper care not to strike heavy blows, all trouble has ceased. For a time, owing to an imperfect gate at the Empire, the pressure was raised 60 to 90 lbs. almost instantly many times a day, and in consequence small leaks developed, though they were easily calked.

Close watching was necessary, however, as a stream no larger than a hair, if it happened to be turned along or against the pipe, would, with the aid of the sand it washed in, cut the pipe badly in a few hours. In one instance, two threads of water, so small that they failed to wet the earth upward to the surface, shot out at right angles to each other, one

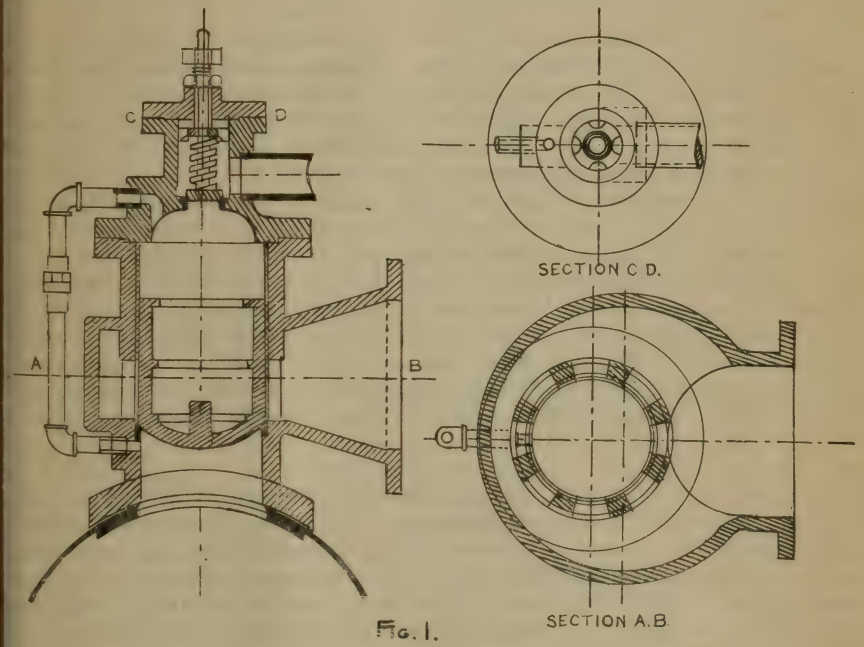


Fig. 1.

from the longitudinal seam, and one from the circular seam near their intersection. These streams, striking each other, formed a miniature whirlpool, which bored a hole through the pipe about the size and shape of the point of a lead pencil, letting out a larger stream, which soon led to its discovery. Where sharp bends were necessary, the pipe, as laid in the trench, was packed on the outer side of the bend by grouting and cement masonry between the pipe and the side of the trench for the full thickness of the pipe.

About 1,000′ from the lower end a 12″ branch with a gate is put in for possible future use, and adjoining it on the lower side a 20″ gate. These are buried in cement masonry, to prevent any movement from thrust when the latter gate is closed, and over all is built a cement masonry gate-house 12′ square, which answers also for a tool-house. At the lower end of the pipe in the power-house there is another 20″ gate, below which is a 12″ branch leading to the Pelton wheel, and adjoining

this is the receiver, 2′ in diameter, on which are the air-chambers charging-tube, and relief valve. The lower end is stopped with a flanged end bolted on, which can easily be removed for extending the receiver for additional power.

The air-chamber is a 10″ lap-welded tube 18′ long, standing on the receiver, with an 8″ gate between. The charging tube is similar, but 8′ in diameter. Both have 2″ water discharge pipes and gates, and by proper manipulation of the gates and the operation of inlet check-valves on top of the tubes, the air-chamber may be filled. Ordinarily the charging-tube is filled up to 90 lbs. pressure from the air-compressor delivery pipe, and then raised by the water pressure. It is found necessary to put in about one tenth of the volume of the air-chamber every day. Where the air goes is, thus far, a mystery, as no leak has been discovered.

The relief valve was designed by Mr. H. Schussler, Chief Engineer of the Spring Valley Waterworks of San Francisco, and is the first of its kind ever made. It is shown in Fig. 1. It seems perfect for the purpose, except that the small pop-valve leaks continually. It is hoped that this fault may be remedied by using a different form of valve. It can be set to open at about 35 lbs. above normal, and will close without jar or hammer. In action, the pressure rises until it lifts a pop-valve in the ordinary way; when this is raised the pressure is relieved on top of an 8″ piston, slightly larger at the top end, which rises and opens the ports of an 8″ outlet. The pressure going down, the pop-valve closes and equalizes the pressure on both ends of the piston, gradually closing it. If the proper pop-valve can be procured, this relief valve will prove a sure safeguard for the pipe. On one occasion already, when from some unknown source a piece of driftwood entered the nozzle and stopped the flow of water instantly, this relief valve saved the pipe from serious shock, if not actual bursting.

*Water-Wheel.*—The demand for direct action under a head of 775 made a large wheel necessary in order to obtain the proper peripheral speed of half the spouting velocity. The manufacturers objected seriously to undertaking anything over 15′ in diameter; whereas the proper speed of 60 to 70 revolutions for the compressors required a wheel of nearly 30′ diameter. A compromise was finally made with a wheel of 18′ 6″ diameter, and a compressor revolution of 110 per minute, and the Pelton Water-wheel Company, of San Francisco, built the wheel from a design by Mr. E. S. Cobb. Had the design been prepared sooner, the wheel could have been made 30′ in diameter equally well. The Pelton Company guaranteed an efficiency of 85% at full load, and an average of 75% from half to full load, of the theoretical power of the water, and, at the same time, to so govern the wheel that it should not exceed 120 revolutions nor raise the air pressure above 105 lbs. per square inch in case of accident to machinery or sudden shutting off of air. The rim is built up of angles and plates riveted together to break joints. It weighs about 6,800 lbs., and is held concentric with the shaft by 12 pairs of radial spokes of 1¼″ rod iron held by nuts to the cast-iron hub. The driving force, being applied to the rim, is transferred to the hub by four pairs of 2″ iron rods, so arranged as to form a truss. Without going into the calculations for strains, which are given as furnished by Mr.

Cobb in Appendix No. 1, it may be stated that the factor of safety is very large for all the strains likely to come on the wheel.

The wheel is set on a 10″ shaft, having a disk crank on either end connected directly to the compressors. The wheel was easily lined up by the nuts on each end of the radial spokes to run almost perfectly true. After a few weeks' use it was found to have worked slightly and was straightened again. It balanced so well that upon shutting off the water it was 14½ minutes coming to rest from 110 revolutions per minute, when disconnected from the compressors. The regulator is a floating valve actuated against excessive velocity by the ordinary ball governor, and against excessive air pressure by a spring set to move when the air pressure in the delivery pipe exceeds 90 lbs. This floating valve admits water on either end of a hydraulic piston which operates a lever moving a hood up and down over the head of the nozzle, thus shutting off or letting the water on to the wheel as the air pressure becomes too great or as the speed gets above or below 110 revolutions. This regulator has now operated the wheel for several weeks and seems almost human in handling its speed. The load can be thrown off entirely and the governor will hold the wheel to 120 revolutions or less, and if all the air-motors happen to be shut down the air pressure will increase rapidly and the wheel slow down, until at 100 lbs. it will stop.

The compressors are so arranged, as will be shown farther on, as to admit of being run at one quarter, one half, three quarters, or full power. It was quite an object, therefore, to have a water-wheel which would give as nearly as possible the full efficiency under these different heads. For this purpose there are four nozzles, one for each of the heads required, and, as the machine must be stopped to change its capacity from one load to another, it is no great inconvenience to change nozzles at the same time, requiring perhaps three minutes. It was of considerable interest to know just what the efficiency of so large a wheel might be, and it was also necessary to measure the water quite accurately for business purposes; therefore, a measuring flume 18′ long and 6′ 9″ wide was constructed to take the tail water on leaving the building. The overflow is a sharp-edged iron about 3″ high and 15″ above the bottom of the flume. No contractions are made. An 8″ pipe about 6′ above the overflow connects with the gauge-box, within which is the measuring scale for the hooked gauge. Great care was used in making the whole apparatus as perfect as possible, and it is believed that the average result of many measurements is within 1% of being correct. The power developed by the wheel was found by taking a large number of indicator cards from the compressors. These were averaged and the friction added, which was found by first running one compressor and afterward running it with the other compressor with the valves out; the difference in the quantity of water used was measured, and the horse-power of this water was called two thirds of the friction of the machine when loaded, which was equivalent to allowing 50% for load. The friction of the water-wheel and its bearings is included in its efficiency. Repeated tests which checked very closely give the wheel an efficiency of a trifle over 90% for one quarter, one half, three quarters, and full loads. Between these points it is somewhat less, as the hood coming down over the nozzle tends to deflect the water as well as hold

it back, and decreases the efficiency. It seems probable that the lon radius of the wheel accounts for the high efficiency.

The illustration of the wheel shown in Plate X was taken before th wheel was tried. The buckets were soon found to be too near together and one half of them were taken off. Actual working has shown tha this wheel has great efficiency at low speed. It began working unde half load, using the half-load nozzle. Gradually in pumping out th mine, as the pumps were lowered and more power was needed, the limi of the machine while running one compressor at 110 to 115 revolution was reached, and the opposite compressor was connected on, the inten tion being to run three-quarters load with the three-quarters nozzle As an experiment, both compressors were connected as if for full load and the half-load nozzle was retained. The result showed considerabl more power delivered with both compressors running at 54 to 65 revo lutions than was obtained before with one compressor at 115 to 120, s much, indeed, that the works were kept running over two weeks longe with the half-load nozzle, though the pumps were lowered on an averag of 18″ per day. Of course, a large portion of the gain in power can b attributed to the saving in friction and improved working of the com pressors under the slow motion, but yet it must be true that the whee loses very little in its efficiency, compared with the accepted ideas o loss in wheel efficiency, working under a peripheral speed of one quarte of the spouting velocity.

*Compressors.*—Mr. E. A. Rix, of San Francisco, who has made a carefu study of air compression, designed the compressors, and they were buil by the Fulton Engineering and Ship-Building Company of San Fran cisco. They are made very heavy, to stand the high piston spee required by the conditions of the water-power. Had it been known a the time of designing this plant that a wheel could have been made like th one described, a diameter of 30′ instead of 18′ would have been chose and the piston speed of the compressors reduced accordingly, for ther is no question but that 60 to 70 revolutions will do better work than 11C The compressor cylinders are 18″ and 10″ in diameter and 24″ stroke with a water-jacket so arranged that two streams of water pass aroun the cylinders in opposite directions. The inlet valves are of the Brenne pattern and open directly into the power-room. Mechanical valves an air inlets from the wheel-pit were considered, but taking into considera tion the class of mechanics likely to handle the machine, and its remote ness from the shops, it was decided to adopt the simplest valves an place them so as to be reached easily. The compressor cylinders wer made sufficiently large to allow for the rarefaction of the air caused b the automatic valve, and all the air that enters the building is forced t come up through the wheel-pit. The other valves are made after th pattern of ammonia compressors.

The most novel feature of these machines is the intercooler. This i made up of 49 soft copper pipes, 1″ in diameter, 18′ long, each with stuffing-box at each end connected with manifold castings. The ai delivered from the first cylinder into one manifold passes through thes pipes to the other manifold, from which it is taken to the second cylinde The whole is placed in the wheel-pit directly under and in front of th wheel, so that the water dashes all over and through it. The air leavin the first cylinder at a temperature of 200° F. passes through the intercoole

and enters the second cylinder at 60°, slightly cooler than when entering the first cylinder. The temperature is again raised to 204° on leaving the second cylinder and passing into the transmission pipe, showing a total rise in temperature of 282° F.

The transmission pipe, conducting the air at 90 to 100 lbs. pressure about 800′ from the compressors to works at the mine, is ordinary well tubing 5¾″ in diameter inside, screwed together in the trench and bent to fit the uneven ground by building fires around it and heating it until its own weight shaped it to the surface. After being laid and covered, it was tested by filling it with water under 120 lbs. pressure, which was allowed to stand over night. No leakage was discovered and none has appeared since. As yet only half of the full load of air has been passed through this pipe, so no data of value regarding loss in transmission through pipes have been obtained. With the present load the difference in pressure between the power-house and the mine is not sufficient to be detected on the ordinary pressure gauge. At the mine there is the ordinary air-receiver and also three 50 H.P. boilers set ready for steam, which are used for receivers.

The air is taken from these into the reheaters designed by Mr. Rix and built by the Fulton Company. As these are the first of their kind, it may be said they have proved remarkably well designed for their work. Experience has shown, however, that slight improvements can be made which would save fuel. At present it requires a little over half a cord of good pine wood each twenty-four hours to heat about 700 cu. ft. of free air per minute to a temperature 350° to 400° F.

The heated air passes through pipes covered with magnesia and hair-felt to the first cylinder of the hoisting engine, from which it is exhausted back into the upper heater, where its temperature is again brought to 350°, whence it passes to the second cylinder at 30 lbs. pressure. From this it is exhausted through a flue to the change house, where it is used for heating and drying clothes. From the first heater also the air for the pump is conveyed some 300′ down the shaft in a similarly covered pipe. The pump was designed and built by Mr. George E. Dow, of San Francisco, and is a tandem compound vertical sinking pump of a capacity of 500 gals. 300′ high per minute. It receives the air at about 275° and exhausts it into the shaft at about 60°, thus giving plenty of pure cool air to the men, without the usual fans or ventilators. At the present writing, this pump is throwing 600 gals. per minute 240′ high.

In addition, there is a direct-acting donkey pump throwing 350 gals. 110′ high situated in another shaft 750′ distant, to which air is carried cold in a 2″ pipe over the surface. An old hot-water heater is used as a reheater for the air, and consumes 12 sticks of pine cord wood per twenty-four hours.

The hoisting engine is a compound, direct-acting Corliss of 100 H.P., with cylinders jacketed for hot air, and is calculated to work 3,000′ down an incline of about 35°. This was also designed by Mr. Rix and built by the Fulton Company. While it is especially adapted to the use of heated air, it takes steam as well as any engine, and in fact was first tested with steam.

*Efficiencies.*—Efficiencies often seem to depend largely on the personal equation of the reporter. Mr. Rix's summary of tests is given in Ap-

pendix No. 2. He spent a number of weeks making them, and while agreeing with him in the main, the following are submitted as the author's conclusions. In any case, the plain tale is this. There is 304 theoretical H.P. in the water used at the power-house, the work actually accomplished at the mine amounts to 203 H.P., and the cost of reheating is $3 per day.

Efficiency of compression and transmission from water-wheel to motors, and not including cost of reheating ---------- $\frac{225.32}{283} = 79.5\%$

Efficiency of compression and transmission from theoretical power of the water to the motors, and not including cost of reheating ---------- $\frac{225.32}{304} = 74\%$

Efficiency from the water-wheel to and through the motors, not including reheating ---------- $\frac{202.7}{283} = 71.6\%$

Efficiency from the theoretical power of the water to and through the motors, and not including the cost of reheating ---------- $\frac{202.7}{304} = 66\%$

Efficiency of compression and transmission from water-wheel to motors, including the cost of reheating expressed in water-power ---------- $\frac{225.32}{307.66} = 73\%$

Efficiency of compression and transmission from the theoretical power of the water to the motors, including the cost of reheating expressed in water-power ---------- $\frac{225.32}{329} = 68.4\%$

Efficiency of compression and transmission from the water-wheel to and through motors, including cost of reheating expressed in water-power --- $\frac{202.7}{307.66} = 65.5\%$

Efficiency of compression and transmission from the theoretical power of water to and through the motors, including cost of reheating expressed in water-power ---------- $\frac{202.7}{329} = 61.6\%$

Horse-power of air at works after reheating: 225.32.
Horse-power delivered to compressors by water-wheel: 283.
Theoretical horse-power of water used on the wheel: 304.
Horse-power of work actually done by the motors: 202.7.
The horse-power delivered by the water-wheel to the compressor, to which is added the horse-power (24.66), which the cost of the wood used in reheating would buy in water $307.66 = 283 + 24.66$.
The theoretical horse-power of the water used on wheel added to the horse-power (24.66) which the cost of the wood used in reheating would buy in water: $329 = 304 + 24.66$

After nearly three months' working of the plant, the author believes the results obtained demonstrate the wisdom of having chosen air instead of electricity.

It may be urged that the conditions are particularly favorable to compressed air, as the transmission is short and the power is not needed for tramways or lighting. For lighting it is admitted without question and possibly for tramways, that electricity is preferable, but for transmission, were it 20 miles instead of 1,000', it is thought by the author that, taking the whole plant, compressor, transmission pipe, and motor as against generator, transmission wires, transformers, and electric motors, the air will prove cheaper in first cost, higher in efficiency, less liable to accident, and less expensive to operate and maintain.

The sense of being solidly supported in his plans and expenditures and encouraged to make his work thorough by the money power behind him, is so rare in the experience of the American engineer as to be worthy of grateful mention; but still more rarely does he find, united to this material backing, the moral support which comes of the comprehension and sympathy of a wise engineer. This was the great good fortune of the author in carrying out the decision in favor of compressed air transmission and other somewhat novel features of the plant, under the sanction of Mr. James D. Hague, the President of the North Star Mining Company.

## Appendix No. 1.

### THE PROBLEM OF THE WHEEL.

By E. S. Cobb.

The problem is to design a wheel, the total weight of which is to be 10,000 lbs., as nearly as possible, the diameter 18′ 4″, the rim of suitable section to receive the buckets of a Pelton water-wheel, and the whole strong enough to be in continuous use at 110 revolutions per minute while transmitting 226 H.P. from rim to shaft.

The cross-section of rim adopted is shown in Fig. 2. It is made up as follows:

Two 6″x 4″x $\frac{5}{8}$″ angles, weighing 20 lbs. per foot, 40 lbs. per foot of rim.
Four 4″x 4″x $\frac{5}{8}$″ angles, weighing 15$\frac{1}{2}$ lbs. per foot, 62 lbs. per foot of rim.
Center plate $\frac{3}{4}$″ thick, 28 lbs. per foot of rim.

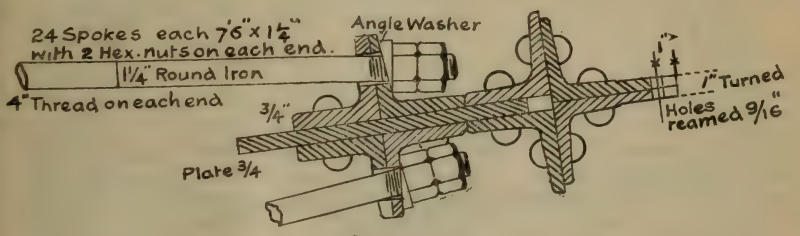


Fig. 2.

The mean diameter of the rim is 16′, and the average weight per foot is 135.2 lbs., including rivet heads. The total weight of the rim is 6,800 lbs.

The rim is held concentric with the shaft by twelve pairs of radial spokes. Strictly speaking, however, these spokes are at a slight angle with the plane of revolution, and this angle is taken into account in the calculations.

For the purpose of determining the maximum strain in working that may be expected by one pair of spokes, the rim is assumed to be cut into twelve pieces, each piece weighing 575 lbs., and being held in position against centrifugal force by one pair of spokes. Then the strain on each pair of radial spokes due to the velocity is found as follows:

$$\text{Centrifugal force} = \frac{\text{weight} \times \text{radius} \times \text{rev.}^2}{2{,}936}.$$ Substituting the proper quantities $\frac{575 \times 8 \times 12{,}100}{2{,}936} = 18{,}958$ lbs., or 9,479 lbs. per spoke.

By reason of the position of the spoke at an angle with the plane of revolution, this strain becomes 10,000 lbs. per spoke. As 1$\frac{1}{4}$″ round iron is used, there is at the bottom of threads a safe area of 0.7854 sq. in., or a strain of 12,700 lbs. per square inch of section, on the assumption that these rods hold the whole of the centrifugal force acting in the rim, without any aid from the strength of the rim itself.

The strain at the least cross-section of the rim when it sustains its own centrifugal force without any aid from the radial spokes is as follows

$$\frac{135.2 \times 8 \times 12{,}100}{2{,}936} = 4{,}458 \text{ lbs.},$$

nearly, per foot of diameter. At 16′ average diameter, the total bursting strain of 71,328 lbs. is held by two sections, or 35,664 lbs. per least cross section. The least cross-section of the rim is the section of the six angle irons, or 30.6 sq. ins. Deducting 25% for unknown imperfections and

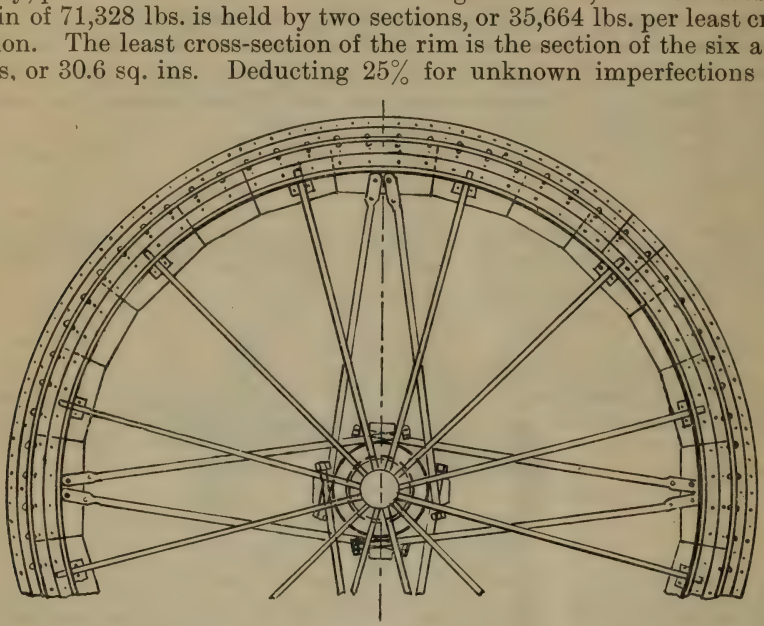

FIG. 3.

rivet-holes leaves about 23 sq. ins. area, giving a strain of 1,550 lbs. per square inch of rim, when it alone is sustaining all the strain due to centrifugal force.

Power being applied to rim to develop 226 H.P. at 110 revolutions per minute, there results as the tangential strain at the ends of the truss rods 1,500 lbs., or 375 lbs. tangential strain at the end of each truss rod. This tangential strain produces in the rod, on account of its position, a tensile strain of 2,207 lbs., or 1,100 lbs. per square inch of net cross-section when seven threads are allowed for.

The general form of the wheel is shown in Fig. 3.

## APPENDIX No. 2.

### SUMMARY OF TESTS OF THE NORTH STAR POWER AND TRANSMISSION PLANT.

By E. A. Rix.

Actual capacity of compressor, 1,412 cu. ft. of free air compressed to 90 lbs. gauge.

Volumetric efficiency, 96.6%, determined as follows:

Barometer pressure, 13.42. At 90 lbs. gauge, compression ratio is $103.42 \div 13.42 = 7.7$. Receiver, air pipe, and all storage, reduced to

90 lbs. gauge, contained 291 cu. ft., which equals 2,240 cu. ft. of free air. Compressor averaged 102½ revolutions to fill this at 90 lbs. from 25 lbs., which was intercooler pressure. Receiver, etc., at 25 lbs. gauge contained 830 cu. ft. free air. 2,240 — 830 = 1,410 cu. ft. delivered by 102½ revolutions; deducting 2% for increase of temperature in receiver makes 1,382 cu. ft. at 60°, the outside temperature. Theoretical capacity of compressor, 1,429 cu. ft. at 102½ revolutions, 1,382 ÷ 1,429 = 96.6 volumetric efficiency. Reduced to 110 revolutions, this gives 1,412 cu. ft. working capacity. To compress this, 304 theoretical H.P. of water was used on 18′ 6″ Pelton wheel, at 110 revolutions.

The indicated horse-power in all the cylinders averaged 250 H.P., and friction load 22 H.P.; total, 272 H.P. 272 ÷ 304 = 90% efficiency for water-wheel.

This friction load was determined when machine had no pressure on it, but was running at normal speed. Experiments on steam compressors show that the friction load is 50% more under full work. This would, then, be 22 + 11 = 33 H.P. friction load, making total of 272 + 11, or 283 H.P. delivered by wheel, or 283 ÷ 304 = 93% of theoretical power in water.

The head of water is 730′ on the wheel.

The work of compression and delivery is 250 ÷ 304 = 82.2% of the theoretical horse-power, or 250 ÷ 283 = 88.3% of horse-power delivered by wheel.

The 1,412 cu. ft. of air is reheated to 350° F., and, considering that it is used in a compound Corliss engine with intermediate reheating, the theoretical potential in the air before use is 225.32 H.P., determined as follows:

The cylinders being jacketed for hot air, the $Y$ which is used in calculations is the same as that used for compound, jacketed compression, viz., 1.3; then

$$Y = 1.3;\ Y - 1 = 0.3;\ \frac{Y-1}{Y} = 0.23;\ \frac{Y}{Y-1} = 4.33.$$

Barometric pressure = 13.42. Outside temperature, 60° F.

The work being equally distributed between the two cylinders, the intermediate pressure will be the mean proportional between the initial and final pressures. Initial pressure, 90 + 13.42 = 103.42. Final pressure, 13.42 + 1 = 14.42 (1 being the exhaust pressure above atmosphere). Then $\sqrt{103.42 \times 14.42} = 38.62$, absolute intermediate pressure. The formula for the work in the cylinders will then be:

$$\frac{\frac{Y}{Y-1} P V \frac{T_3}{T}\left(1 - \frac{p_2}{p_1}\right)\left(\frac{Y-1}{Y}\right)}{33{,}000}$$

in which the elements are

$$\frac{Y}{Y-1} = 4.33$$

$P$ = barometric pressure per square foot = 13.42 × 144.
$V$ = cubic feet free air.
$T_3$ = temperature of reheating, absolute = 461 + 350 = 811.
$T$ = absolute outside temperature = 461 + 60 = 521.

$p_2$ = intermediate pressure = 38.62.
$p_1$ = initial pressure = 103.42, and

$$\frac{Y-1}{Y} = 0.23.$$

Then substituting, the equation becomes:

$$\frac{4.33 \times 13.42 \times 144 \times 1{,}412 \times \frac{811}{521}\left(1 - \frac{38.62}{103.42}\right)0.23.}{33{,}000}$$

Or $554.96 \times 0.203 = 112.66$ H.P. in one cylinder, or 225.32 H.P. in two cylinders.

Inasmuch as $3 worth of wood, or its equivalent, 15 inches of water at 20 cents an inch, has to be added for reheating, the following allowance must be made for this: 15 inches of water under 730′ head equals 30 H.P. The work of compression and delivery being 82% of the theoretical horse-power, $30 \times 82.2$, or 24.66, represents the actual value of power delivered to the air to account for reheating; then, $250 + 24.66 = 274.66$ is the total power spent on the air. It has a theoretical potential of 225.32, and consequently $225.32 \div 274.66 = 82\%$. Counting from the theoretical power in the water, the efficiency would be $225 \div 304 = 74\%$.

This 82% represents the efficiency of the compressed air system under unfavorable circumstances. It was deemed advisable to have the water-wheel on the compressor shaft, and 18½′ was the limit of diameter which could be contracted for. This made a revolution speed of 110, and a piston speed of 440, which reached 660′ at the half stroke just when discharge was beginning from the cylinders. These piston speeds are too high for economical work. Running the water-wheel throttled at 80 revolutions, or a piston speed of 320′, the indicator cards showed a horse-power of 247, including the friction load. This would show an efficiency of $225.32 \div 247 = 90\%$, or from the theoretical water-power $225 \div 275 = 80\%$, and were the same plant to be built again this could easily be attained, because it has been ascertained from the experience with the present water-wheel that its diameter can be increased so as to run at 80 revolutions.

What power value will be in this 90% efficiency will depend largely on the motors used. The theoretical potential was calculated on the assumption that compound Corliss, jacketed, double-reheated engines should be used. Allowing that these engines have a mechanical efficiency of 90%, which is not a high efficiency, the horse-power realized will be $90 \times 90$, or 81% of the indicated horse-power of the compressors, or $90 \times 80 = 72\%$ of the theoretical value of the water-power. With other classes of motors, the value of their work can be proportioned to the above percentages directly as their economic value is to that of the compound Corliss motor from which the air potential was assumed.

When the pump was first started it made 71 strokes, theoretically 710 gals., or 5,893 lbs. The pump has a volumetric efficiency of 95%, which would make this quantity 839,752 foot-pounds. This was done with the compressor running at 80, and the air pressure at 90. At the present time, the pump is making 60 strokes or 4,980 lbs., pumping 230′, making 1,145,400 foot-pounds, or, at 95% volumetric efficiency,

1,088,130 foot-pounds. This is being done with 93 single revolutions, at 90 lbs.

The compressor is making 90 single revolutions at an average of 92½ lbs. pressure, which is equivalent to 93 single revolutions at 90 lbs., in order to reduce both the performances to the same pressure.

The difference between the foot-pounds of work in both of these cases, viz., 1,088,130 — 839,752, is 248,378 foot-pounds. The difference in revolutions is 13; consequently 13 revolutions did 248,378 foot-pounds of work, or 19,100 foot-pounds for one single revolution.

It is evident that this work is what the pump is capable of doing, independent of its friction of pipes, etc., because the friction of the pump and the friction of the pipes within the small working limits of this pump are practically the same, as will be seen from the following: For 93 single revolutions, were there no friction of pipes or inertia of pump to overcome, it is evident the pump should perform 93 times 19,100 foot-pounds of work, or 1,776,300 foot-pounds. It really did 1,088,130 foot-pounds, the difference being 688,170 foot-pounds, which is the friction of the pipes and inertia losses.

In the other case 80 revolutions should have done 80 times 19,100, or 1,528,000. It actually did 839,752, the difference being 688,248; again almost identical with the first proposition. So the mean between these two, or 688,209 foot-pounds, is the actual pump loss, and this loss it would seem is almost the same at any head within the working limits of the pump.

The loss now being determined, it is possible to determine what actual work is being done, and if the pump efficiency is determined, a check can be made on the potential of the compressor.

If at 93 revolutions the pump does 1,088,130 foot-pounds of work, and the friction is 688,248 foot-pounds, and 19,100 foot-pounds are added for each single revolution of the compressor up to its limit of speed, viz., 220 single revolutions, this last amount being 2,425,700 foot-pounds, there would result a total of 4,202,078 foot-pounds of work which the pump would do when the compressor is running its 220 single revolutions, or its limit. If there is deducted from this amount the friction and inertia loss of 688,248 foot-pounds, the result is 3,513,830 foot-pounds, which is the usual effort of the pump, and the ratio between what the pump actually does and the foot-pounds of work it consumes would be its efficiency, which, upon dividing these sums by each other, shows the mechanical efficiency of the pump to be 83%.

If the potential of the compressor is 225.32 H.P., and the efficiency of the typical motor is 90%, then the brake horse-power possible for the typical motor would be 225.32 times 0.9, or 202.7 H.P. for 220 single revolutions of the compressor. For one revolution it would be 0.992, which is 30,426 foot-pounds.

The pump actually does 19,100 foot-pounds for one revolution. The ratio therefore between 19,100, which the pump actually does, and 30,426, which the typical motor would be capable of, would be the pump efficiency as compared to that of the motor. This would be 62%. This includes temperature, the friction in pipes, and inertia losses between the reheater and the pump exhaust.

Inasmuch as the pump did 4,202,076 foot-pounds of work with an efficiency of 62%, as compared to the typical motor, the typical motor would yield 4,202,076 ÷ 0.62 = 6,600,000 foot-pounds, or 200 H.P.,

which compares very favorably with the original calculations for the brake horse-power at the potential as being 202.7.

Recapitulating these figures:

| | Foot-Pounds. |
|---|---|
| The total work done by the pump | = 4,202,076 |
| The total brake horse-power of the ideal motor | = 6,600,000 |
| The total potential of the air after reheating | = 7,434,900 |
| The total work spent on the air, including the energy of reheating at 440′ piston speed | = 9,042,000 |
| The total work spent on the air, including the energy of reheating at 320′ piston speed | = 8,215,000 |
| Theoretical power of the water at 440′ piston speed | = 10,032,000 |
| Theoretical power of the water at 320′ piston speed | = 9,205,000 |
| Total power of the water, including the energy of reheating at 440′ piston speed | = 10,692,000 |
| Total power of the water, including the energy of reheating at 320′ piston speed | = 9,865,000 |

Under the lower piston speed, which should be the proper speed to run the compressor, the ratio of original power and reheating, 9,860,000 foot-pounds, and the total pump result, 4,202,000 foot-pounds, would be 44%, which would be the efficiency from first to last as far as the pump system was concerned, and the ratio between any other of the elements in the preceding recapitulation will be their relative percentages.

# THE COMING MOTIVE POWER.

## IS COMPRESSED AIR DESTINED TO BECOME THE RIVAL OF ELECTRICITY?

By Joseph W. Buell.

From "The Inventive Age," Washington, D. C., December, 1895.

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Many and marvelous are the inventions which have grown out of electrical discoveries and research, until it seems, from their multiplicity and present state of perfection, that the spirit of invention which animated these creations must soon slumber. Mighty, indeed, has been the revolution in the affairs of man wrought by electricity, under the command of genius, even though its march has been in the wake of that other potent force in civilization—steam. Notwithstanding these achievements, the commercial and industrial world is fast becoming conscious of the fact that its future rapid strides and ultimate commercial supremacy, as a motive power, will depend on cheapening the production of this form of energy, so as to oust steam, which feeds wastefully on costly coal. If this problem remains much longer unsolved, its toiling in the field of transportation, and in the workshop, will be shared by some other of nature's forces, for investors have begun to seriously realize that the millions which have been expended for franchises, dynamos, copper wire, etc., are not fruitful in dividends. It is stated that only one fifth of the electric lighting stations in the United States are paying 4½%. Is it the uneconomical process of generating electricity by the initial power, steam, that is responsible for seventy-four electrical railroads, representing a billion and a half of dollars, being now in the hands of receivers? It is true that dynamos, in their present state of development, give out a high percentage of the engine's power imparted to them, and though we find the latter supplying in mechanical energy only 10% of that represented by the furnace heat, yet this wasteful process is not directly chargeable to the engine's incapacity to transform power delivered to it; but the trouble is due to the inability of the boiler to absorb and convert the major portion of the heat energy liberated in its fire-box. These significant facts have already influenced the recent course of electrical investments, and now the selection of a cheap initial power for generating electricity is the all-important question of the day. Eminent engineers and scientists are at work upon this problem, some endeavoring to produce electricity direct from coal or chemicals by rapid decomposition, or other methods of electro-chemistry, with a view of locating power plants in the coal-fields, or by the sea, and telegraphing the currents so derived to the cities for consumption, while others are seeking sources of energy to be found in water-powers, or in the fitful but giant forces of nature, as tides and winds—and the promise recently given that Niagara would soon be a captured Pegasus and harnessed, so as to become a useful wheel-horse, instead of a prancing, plunging steed, is now fulfilled.

This development of power in the bosom of nature, many miles distant from industrial centers, presents other problems, requiring skill of the highest order, in their solution, namely: the economical transmission and distribution of currents of great magnitude and intense energy over long distances. When large accumulations of electric current are concentrated and prescribed to flow over a conducting wire, it becomes elusive and intractable as it flows forth, and rather than follow the pathway appointed for it to travel, it wastes itself, or passes to other substances and is dissipated so rapidly, that if it is transmitted any great distance the loss becomes so great as to render its transmission impracticable. Thus it can be seen that while electricity has not yet succeeded to its estate, the solution of these problems will mark a new era in the history of this subtle element. The applications of electric energy to industrial and commercial uses are so numerous and varied, and this singular phenomenon has received so much attention at the hands of the scientist, the engineer, and the capitalist, that the world has become fascinated by its conquests, till now the impression prevails that electricity must necessarily become the motive power of the age. The writer does not claim that this, the above tendency, is a false one, but simply is set forth to show the reasons why other available forces in nature have received so little attention and consideration. Among these neglected forces, compressed air may be mentioned as a means of power transmission that has not received the attention it deserves.

## EARLY ATTEMPTS TO USE COMPRESSED AIR.

The application of compressed air to industrial purposes dates from the close of the last century, although before this we find isolated attempts were made to apply it in a variety of ways.

To the fertile brain of Dr. Papin, of France, we are indebted for the first suggestion of conveying parcels in a tube by compressed air, and he was the first to suggest the use of compressed air as a means of transmitting power. This distinguished Frenchman went to the expense of putting his ideas into wood and metal, but the results of his experiments were not encouraging. This was about A. D. 1700.

About a hundred years later, a Welsh engineer contrived an apparatus to utilize a water-power to work a blast furnace and machinery, a mile and a half distant, by compressed air, but the resulting blast was feeble.

For a century or more water-elevators operating by compressed air have been used in the mines at Chemnitz in Hungary. Vague descriptions of apparatus for using compressed air in the mechanical arts are found in early English patents and publications, but none, so far as known, were practically applied. In 1810, Medhurst, of England, patented means for conveying parcels by compressed air. There is no authentic record that his project was reduced to practice, and it stands simply as a mile-post on the road toward the advancement of knowledge in this direction. In 1824, Vallance revived the idea of Medhurst. Contributions to this science were also made by such pioneers as Pinkus, Cleeg, and Pilbrow.

In 1837, the Italian government ordered experiments to establish the laws that govern air transmission, and improvements in methods and

appliances have followed, resulting in the practical use of air for tunneling, in conveying parcels in tubes, and that valuable adjunct to railway trains—the air-brake.

Along about 1857 an American, Dr. Gorrie, exhibited in London and elsewhere cold-producing machines, in which air was compressed in one cylinder, cooled whilst compressed, and re-expanded in another cylinder, in a manner to utilize its expansive force. In 1859, a company was formed in London, and permanent pipes laid down for conveying parcels by air; these lines of pipe were extended in 1865. During the same year Ericsson operated eighty sewing-machines by compressed air in a factory in New York.

Experimental sections of pneumatic dispatch tube for carrying passengers were built at Sydenham, England, and in New York in 1867. The line at Sydenham was 600 yards long, and was traversed in fifty seconds with a pressure of 2½ ozs. per square inch. In 1872 Congress appropriated $15,000 for a pneumatic dispatch tube between the Capitol and the Government Printing Office in this city.

Other systems have been multiplied by telegraph and express companies in Vienna and Berlin. The Western Union Telegraph Company conveys messages from lower Broadway to Twenty-third Street in New York, a distance of about three miles. They employ a vacuum, and the parcel travels between the terminals ordinarily in five minutes. Air was used for rock-drilling in tunneling Mount Cenis, Hoosac, Arlburg, and other mountains. In 1879 air was used to propel cars on the Second Avenue Railroad, in New York.

This was briefly the state of the art up to 1880, but the dreams of Papin and the hopes of Medhurst were but partially realized. The disappointments of the past are, however, no cause for apprehension of the final successful application of air for transmitting power. Many of the grandest successes of the present were absolute failures in the early attempts. Previous to 1880 the waste of energy in the compression of air, and the sickly design and faulty construction of mechanism for using air, due largely to the ignorance of the principles of thermodynamics, retarded the introduction of air as a mode of transmitting power. At Mount Cenis tunnel, the loss in compression was fully 90%. In the modern compressors the loss is less than 16%.

While compressed air has been used over and over again in a small way, and generally in a rough and uneconomical fashion, it was not until within a few years that any systematic attempt has been made to transmit and distribute this form of power for general consumption. To-day this is being successfully done in Paris and Birmingham, England, where the installations have given birth to applications and utilizations for purposes heretofore unthought of, with valuable economic results, and a realization of high efficiency in its workings.

In Paris the power is distributed not only to factories and electric lighting stations, but also finds domestic use, being sold to householders, restaurant-keepers, etc., keeping them supplied with an available power which is turned to account in many useful ways, in producing the conveniences and comforts of life, while proving a welcome substitute for steam-power, with its heat, smoke, danger, and waste.

The commercial advantages derived from these air systems have resulted in their rapid extension, and in Paris elaborate provision is being made to increase the size of the plant with a view of supplying an aggregate of 25,000 H.P.

THE POWER YIELDED.

The general efficiency of this mode of transmitting power in these two systems is conservatively put at from 80% to 85%, a showing that puts to flight the idea that the transmission of compressed air over a distance of several miles necessarily entails enormous losses. The attainment of this efficiency is gained by the help of another physical agent, in connection with the observance of certain simple laws, and an explanation in regard thereto may be readily understood without wading too deep into the water of science; and when understood will make clear the reasons why heretofore the progress in the introduction of a power so rich in possibilities has been impeded, while the truth becomes apparent that there is very little loss of power through its transmission if properly manipulated. In order that the reader may understand the elements involved in the solution of this problem it is necessary to gain a few preliminary ideas as to the behavior of air under prescribed conditions. Air under compression when impelled to move in a certain path is governed by laws quite different from those affecting electricity. As the air flows through the pipes the resistance of the surface of the same has to be overcome, and whenever compressed air meets resistance the pressure falls slightly, but this moderate reduction in pressure does not involve a loss in transmission, because what the air loses in pressure it gains in volume, so that its mechanical effect may at any point be easily restored to its initial capacity by the application of a small amount of heat, and it has been found that by this simple expedient its capacity to do work at the points of consumption many miles from the power-station is enhanced with but a nominal cost, and that no more economical effect of the application of heat has ever been found than this method of annihilating the effects due to friction in the air's transmission. An eminent English engineer declares that a quarter of a pound of coke per hour per indicated horse-power is sufficient to heat the air required in a moderate sized engine. Nor does this fairly illustrate its economic value, when we come to consider that it is capable of another important service (as alluded to in Dr. Gorrie's discovery) at the points of consumption, in the use of the by-product, the exhaust from the motors—for the purposes of ventilation and refrigeration. In Paris the restaurants and beer-cellars are supplied with refrigerant in this manner and which proves highly satisfactory in every respect and displaces the ice-melting method altogether, and in some cases is so sought after for cold storage that power is consumed essentially for its exhaust to use to this end.

In this country compressed air is being pressed into service in small ways in every branch of industry, but the use to which the public is most familiar is probably in its application to railway trains in its adaptation to applying the brakes; but its utility and operation in this connection are scarcely appreciated until we come to consider the conditions of its use. While we have all noticed that trains cannot be gotten under way until the locomotive has run some distance, to work up speed, it is doubtful if we have ever stopped to think of the tremendous momentum that is being piled up as that speed increases and the energy that must be destroyed in bringing a train to a sudden stop, after it has gotten under way. It is estimated that the vast amount of energy that

must be called into action at a moment's notice is greater than can be imparted to a projectile by the largest of modern guns. Its triumph in this direction is daily evidenced, and is the one important factor that has made speed in railway travel reconcilable with safety. How few of us have realized the importance of this daily performance. A train running 40 miles an hour traverses 59′ in each second—lurking danger appears in sight—the loss of one second through the lack of vigilance on the part of the engineer means its hastening on an errand of destruction, by just 59′. By the touch of a lever the brakes are applied and the train that was rushing along at almost lightning speed is brought to a standstill in a minimum of time and within a distance of 400′ from where the danger was sighted, and this prodigious power that is brought to bear on the brakes is so ingeniously distributed and applied as to relieve the cars of all strain, while the train is promptly arrested in its flight without creating any commotion among the passengers or giving rise to a disagreeable shock.

## AN ACT

MAKING APPROPRIATIONS FOR THE CONSTRUCTION, REPAIR, AND PRESERVATION OF CERTAIN PUBLIC WORKS ON RIVERS AND HARBORS, AND FOR OTHER PURPOSES.

[Passed the House June 2, 1896, and the Senate June 3, 1896.]

For the construction of restraining barriers for the protection of the Sacramento and Feather rivers in California, two hundred and fifty thousand dollars; such restraining barriers to be constructed under the direction of the Secretary of War in accordance with the recommendations of the California Debris Commission, pursuant to the provisions of and for the purposes set forth in section twenty-five of the Act of the Congress of the United States, entitled "An Act to create the California Debris Commission and regulate hydraulic mining in the State of California," approved March first, eighteen hundred and ninety-three; *provided*, that the Treasurer of the United States be, and he is hereby authorized to receive from the State of California, through the Debris Commission of said State, or other officer thereunto duly authorized, any and all sums of money that have been, or may hereafter be, appropriated by said State for the purposes herein set forth. And said sums when so received are hereby appropriated for the purposes above named, to be expended in the manner above provided.

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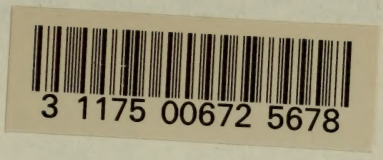
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